ENGINEERING and MINING JOURNAL.

VOL. XXV., NO. 9. WITH SUPPLEMENT.

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NOTE.—Communications relative to the editorial management should be addressed to Mr. ROTHWELL. Articles written by Mr. RAYMOND will be signed thus *
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OUR WESTERN OFFICE AT DENVER, COLO.

Gen. FRANCIS L. VINTON, Mining Engineer, is in charge of the Western Office of the ENGINEERING AND MINING JOURNAL, at Denver, Colo. Communications relating to the business of his department can be addressed to him at Denver. Correspondence for the ENGINEERING AND MINING JOURNAL should be addressed to the Editor in New York.

WE need make no excuse to our readers for devoting so large a proportion of our space to the report of the meeting of the Institute of Mining Engineers, for its papers are of great interest and value. We reproduce a number of these papers in full as read, and expect to finish the report in our next issue.

THE REMONETIZATION OF SILVER.

THE Silver Bill has been passed over the President's veto and becomes law. It is needless now to urge objections to this legislation; all that remains for us to do is to congratulate the advocates of unlimited legal tender silver on the success of their programme thus far, and await, with what patience we may, the sudden and unparalleled prosperity which they have so often assured us would follow this enactment. We wait for the prosperity.

NEW PUBLICATIONS.

A MANUAL OF ENGINEERING SPECIFICATIONS AND CONTRACTS, *Designed as a Text-Book and Work of Reference for all who may be Engaged in the Theory or Practice of Engineering. By* LEWIS M. HAUPT, *Professor of Engineering, Towne Scientific School, University of Pennsylvania, etc., etc.* Philadelphia: J. M. Stoddart & Co., 1878. Price, $

The title of this work at once justifies its introduction to the public as calculated to fill an existing and acknowledged vacancy; while the name of the author inspires confidence in the manner of execution of so admirable a project. An examination of the book does not disappoint the expectations thus raised. The subjects of drawings, estimates and measurements, specifications, advertisements, bids and contracts are considered from the standpoint of the engineer, the contractor, the man of business and the lawyer, with excellent practical judgment and each chapter is provided also with appended questions, by the use of which the book becomes a manual of instruction. Many valuable tables for application in practice, a glossary of technical terms and a full index complete the usefulness of the work, which we heartily recommend to both instructors and constructors.

AMERICAN INSTITUTE OF MINING ENGINEERS.

The twenty-third meeting of the Institute was begun on Tuesday evening, February 26, and concluded on Thursday, February 28, at Philadelphia.

The Institute was called to order by Dr. T. STERRY HUNT, the President. Among the members in attendance at this first session were Messrs. A. L. HOLLEY, ECKLEY B. COXE, MARTIN CORYELL, JOHN FRITZ, GEORGE ASMUS, J. C. SMOCK, H. S. DRINKER, PERSIFOR FRAZER, JR., J. H. HARDEN, E. B. HARDEN, J. BLODGET BRITTON, O. J. HEINRICH, E. F. LOISEAU, W. E. C. COXE, J. S. ALEXANDER, FREDERICK PRIME, Jr., BERNARD FERNOW, C. H. RONEY, C. A. YOUNG, JOHN BIRKENBINE, E. BORDA, B. F. FRAZIER, C. E. BILLIN, H. S. MUNROE, etc. The place was the pleasant room of the Philosophical Society, which is very well adapted to the proceedings of a scientific or technical character, before a select audience.

PRESIDENT HUNT'S ADDRESS.

After a few introductory words concerning the importance even of apparently remote theoretical speculations to the arts which involve the application of science, Dr. HUNT began by referring to the great amount of carbon present in the rocks, not only in the shape of coal, but also in the various bituminous shales or pyroschists, and also in the form of bitumen and petroleum. All sound analogy leads us to conclude that these substances have an organic origin, and have been formed by the deoxidation of carbonic acid, a process effected in the growing plant and attended with the evolution of oxygen. He showed that the carbon of a layer of coal covering the outer surface, one meter in thickness, would, in its production from carbonic dioxide, liberate an amount of oxygen equal to that now present in our atmosphere; and then proceeded to explain that in the production of hydrocarbon, like bituminous coal and petroleum, there was liberated a large additional quantity of oxygen from the deoxidation of water. It is probable that the total amount of deoxidized carbon and hydrogen in the earth exceeds many times the above estimate, and consequently that the disengaged oxygen in past ages must have far exceeded that now present in our atmosphere. How far this excess had been absorbed in the peroxidation of ferrous oxide in the decay of rocks could not be quantitatively determined. But the amount of carbonic acid then removed from the air was small when compared with that absorbed in the production of limestones. Calculations showed that this amounted to, probably, not less than two hundred atmospheres like the present one. But at the temperature under which life can exist a pressure of less than one hundred atmospheres would reduce carbonic dioxide to a liquid. Unless we suppose, then, that animal and vegetable life could exist under such conditions, we must suppose this gas to have been gradually supplied as its absorption went on in the generation of limestones and hodrocarbons. It was shown that this source could not be reasonably found within the earth's crust, and the only hypothesis remaining was that a supply has come from extra terrestrial regions. If, said the speaker, we suppose that our atmosphere is not terrestrial, but cosmical —that it is, in short, a portion of a universal elastic medium, extending throughout all space, forming the interstellar ether and condensed around centers of attraction according to their mass and temperature, we might conclude from the laws of static equilibrium and of the diffusion of gases that any disturbance in the composition of our terrestrial atmosphere, due to a disengagement or an absorption of any gas or vapor, would affect the universal atmosphere. Thus the fixation of carbonic dioxide at the surface of our own or of another planet would bring in fresh supplies of this gas from outer space, so that eventually the balance would be restored. Such a hypothesis was not wholly new, as it had been foreshadowed by Sir W. R. GROVE, more than thirty years since, and had moreover been considered in some of its bearings in an essay by the speaker published in 1874.

The spectroscope teaches us the unity of chemical composition in all worlds; but these considerations lead us to the conclusion that ties more immediate than the vibrations of light bind us to the outer universe, and that there is no physical change going on in our own atmosphere, which does not carry consequences which are felt throughout all worlds.

The relation of these atmospheric changes to the climate of former geologic periods was noticed, and it was shown that we have here an explanation of the tropical climate formerly prevailing in polar regions, and of the slow refrigeration which we note through the tertiary age, down to our own. Its bearings on the glacial theories are also important.

The speaker, in presenting such a subject, by way of introduction to the more practical discussions which were to occupy the attention of the Institute, had wished to show by what necessary links the most abstract questions of science are bound to the problem, like that of our coal fields and our future supply of mineral fuel.

ARTIFICIAL FUEL.

A paper "On the Manufacture of Artificial Fuel at Port Richmond, Philadelphia," was then read by E. F. LOISEAU:

After narrating the experience of the Anthracite Fuel Company, at Port Ewin, near Rondout, N. Y., which he described as a practical success, after many of the discouragements, delays, etc., incident to new enterprises, Mr. LOISEAU alluded to the changes in the size of the lumps manufactured—larger lumps being now made in Europe, as in this country, in order to increase production and cheapen cost. The larger lumps require stronger draft for combustion. Hence, the use of artificial fuel has been confined chiefly to steamers and locomotives. The machines invented by M. REVOLLIER-BIETRIX and M. COVILLARD, of France, for compressing small lumps, have produced per 24 hours not more than 48 gross tons in lumps weighing each 1·250 kilograms. They are on the principle of Gard's brick machine.

Mr. LOISEAU designed several machines for the continuous and automatic production of small lumps. The main machine was the press. A small one was shown to the Institute in 1874, at Mauch Chunk. A large one, producing 137½ tons in 10 hours, in lumps weighing about two ounces, is now at Port Richmond. The machine was described by Mr. LOISEAU who gave an account of the difficulties which had been overcome in getting it to work successfully.

The coal dust in the yard at Port Richmond lies on swampy ground, and also draws water from high tides and from rain. This necessitated a drying-apparatus composed of two heated inclined drums, 18 ft. by 30 in.,

through which the coal dust passes in five minutes, and is sufficiently dried.

The drying-oven for the lumps also presented difficulties in practical arrangement and operation, which are finally believed to be due to insufficient area of air-passages and escape-flues for vapor. These are to be enlarged, and Mr. LOISEAU expects to put his prepared fuel into the market in the course of a few weeks.

At the close of the paper the President made a few remarks, in recognition of the ingenuity and perseverance of Mr. LOISEAU in the prosecution of this enterprise.

Mr. RAYMOND inquired whether the changes in the process, described by Mr. LOISEAU as introduced at Port Richmond, involve extra cost in the manufacture.

Mr. LOISEAU replied that on the contrary there was a saving in fuel or labor attached to each of the changes described. In reply to a question from Mr. COXE, he added, that the escape from a high stack of the benzine vapors from the water-proofing tank was not complained of in the neighborhood. As it appeared presently that "the neighbors" were Mr. LOISEAU'S own workmen, this testimony to the agreeableness of the odor of benzine was received with a smile.

THE ECONOMY EFFECTED BY THE USE OF RED CHARCOAL.

A paper on this subject was read by MR. BERNARD FERNOW, late member of the Forestry Department of Prussia, as follows:

The question of preserving the forests in this country, important not only to the trades using the wood, but to the whole nation, though agitated these many years, has not yet received that general consideration which its broad bearing demands.

Those who are interested in and working for a reform in the treatment of American forests are looking to the Government for help, are suggesting the creation of a commission to study the condition of foreign and of domestic forests, and expecting everything from the introduction of a sound system of managing the woodlands.

This reform will cost time and money; so much the more because the Government can bring to bear upon private owners hardly any power except that of good example and encouragement.

But there is another means of preserving the forests, which is open at all times to everybody using wood, and instead of being costly, yields, from the very outset, a profit, besides being, in a greater measure than might be expected, effective to the purpose for which we recommend it. This means is a more economical use of the valuable material which our forests offer; a more careful and exhaustive utilization of its constituents in all cases where wood or its products are applied.

The wasteful consumption of wood in the United States is in every way so enormous as to justify the statement that by merely adopting an economical husbandry in this particular the destruction of forests might be delayed for many years, while in the absence of this imperatively needed and immediately practicable reform, legislative remedies are deprived of much of their value.

In this connection, I wish to draw the attention of metallurgists, especially those who are interested in the manufacture of charcoal iron, to an application of this principle in which they might assist the reform so much needed and at the same time realize an important advantage for themselves.

For thousands of years of human history wood was the main, nay, the only material, which served generally as fuel. Mineral coal came into use only in the twelfth century; and it is but recently that it has displaced to a considerable extent its less carbonaceous predecessor as fuel.

The art of concentrating this material in the form of charcoal for easier transportation and readier use in distant places was, according to Pliny, known to the ancients long before Christ, and was practiced in all countries, especially in connection with the iron manufacture. Nevertheless, important as the material, and extended as its use has been, practically hardly any progress has been made in developing this art down to the present time, and the charcoal-burner of to-day is scarcely advanced beyond his predecessor of 2,000 years in the method of treating wood to obtain a better, surer and larger yield.

Of course attempts have been made to bring the process to a more scientific basis, but all these improvements have not amounted to enough to give perfect control of the process to the burner, or to secure a larger yield of the contents of combustible matter in the employed raw material.

"Meiler"-charring (or, as it is called in this country, burning in pits), with its dependence upon weather and good luck, its uncertainty of a long extended period of burning, and many other inconveniences, still claims to give the best results; and only reasons outside the process itself have led to the more general use of kilns, which give a weaker coal and a smaller yield.

To economize in another direction, namely, by gathering the by-products lost during the process of meiler-charring, various contrivances have been proposed. Some of these are employed with good effect, though not without injury to the final product, the coal, which generally is rendered less valuable by such processes. In this country, so far as I can ascertain, no pains are ordinarily taken to utilize these by-products, though it would be easy to do so, since the use of kilns, which facilitates the winning of the by-products, is more common here than in the old countries.

But, as above remarked, in operating for these by-products, the main product, charcoal, is generally neglected and is mostly of a weaker quality.

The general results obtained by the manufacturers, who distill wood with the greatest precaution in close vessels, and who have in view the utilization of all products resulting from the operation, may be expressed thus for 100 parts of wood:

Charcoal	26 parts.	Carbonic acid and oxide	37 parts.
Pyroligneous acid and water	30 "	Hydrocarbons and uncondensed water	
Tar	7 "		
	100 parts.		

If to these numbers the weight of wood necessary as fuel, to effect the distillation, about 12½ parts, be added, the results will agree well with what is arrived at in burning for charcoal.

These results agree pretty closely with those of theoretical calculation, by which it is found that to expel the oxygen and hydrogen contained chemically in 112·5 parts of wood, together with the moisture in combination, which all in all amounts to about 67½ parts, about 4·50 parts of charcoal are required, but practically much of the carbon is carried away in the gases, so that 8½—9 parts of carbon are lost in the charring of the above-named quantity of wood. These figures show that no very considerable improvement toward producing a larger yield of carbon can be made upon the common method, by which, if carried on carefully, from 25 to 27 per cent. of the weight of the original material is obtained.

To two Frenchmen, SAUVAGE and BERTHIER, is due the first essential step toward producing a better fuel, in larger quantity, from the process of charring. Although their discoveries were made nearly thirty years ago, and have found acceptance in France itself, in Belgium, and in parts of Germany, it is strange that in this country the very name of the new products seems to be unknown to many users of charcoal.

The material to which I allude is known under the name of red charcoal, *charbon roux* of the French, *rothkohle* in German.

SAUVAGE found, by experiments, that a perfectly charred coal does not give the largest quantity of combustible matter in the smallest volume, but on the contrary, that this relative quantity increases to a certain point of the process and then begins to decrease.

After the process had been conducted for five and one-half hours, he claimed to have attained the greatest yield of combustible matter.

His results were the following:

100 kilos. of wood charred for.....	3 hours.	4 hours.	5 hours.	5·5 hours.	6·5 hours.	In the Meiler.
Weighed kilos.....	65·4	53	47	41·5	39·1	17·2*
100 cub. m. measured respectively..	86	76	58	55	52	33
100 cub. dec. of wood containing 3,153 parts weight of combustible 100 cub. dec. of coal yielded.....	3,118	3,139	4,009	3,849	3,997	3,867

* This result is rather low for good practice.

After 5½ hours the water and acetic acid are evaporated and the product is an imperfectly charred coal of dark red or brown color. This product without water and acetic acid still contains the tar and combustible gases, both of which contribute to a higher heating capacity.

A simple calculation shows in what degree this higher heating capacity is possessed by the red charcoal.

Practically, 100 kilos. of air-dried wood may be said to contain 40 kilos. of carbon, 40 kilos. of water chemically combined, and 20 kilos. of hygroscopic water. Computing the centigrade heat unit of carbon at 8,080, and deducting for the evaporation of 60 per cent. water, 32,400 heat units, we find in this compound of combustible matter 290,800 effective heat units. From this, if hard wood is taken and treated in an oven, there can be got:

26 kg. of charcoal @ 7,640 heat units	198,640 heat units.
7 kg. of tar @ 4,547 heat units	31,829 "
2·5 kg. of conc. acetic acid @ 3,213 heat units	8,003 "
Total	238,472 heat units.

Therefore, to make up the original 290,800 heat units, 50,328 heat units must be reckoned as lost in the gases during the process.

This last amount is retained, and the acetic acid is removed in the production of red charcoal. In this way, of the 40 per cent. of combustible matter, which accompanies the customary methods of charcoal burning, over 30 per cent. are saved and made available as heat-producing material, since the red charcoal affords:

From coal	198,640 heat units.
From tar	31,829 "
From combustible gases	50,328 "
Total	280,797 heat units.

In other words, this fuel retains $\frac{28}{29}$ of the heating value of the wood, while charcoal represents only $\frac{20}{29}$, since the value of the gases lost is equal to $\frac{8}{29}$ of the raw material, representing ¼ of the value of the charcoal; and to this must be added the heating value of the tar gases, $\frac{3}{29}$ of the raw material, or $\frac{3}{20}$ of the charcoal.

That it is more profitable to preserve this heating capacity in the fuel itself than to conduct the charring so as to waste and injure the fuel in order to obtain the gaseous products for other purposes, experience has proved in most parts of Germany, and is most evident in this country, where the transportation of the cheap products over country roads would consume all the profits.

The weight of the fuel, on the contrary (it being more solid than the common charcoal), increases over 30 per cent., by gaining over 30 per cent. heating power; besides, there is a gain of nearly 10 per cent. in material, which during the transportation of the more friable common charcoal is lost as dust.

This gain is made, moreover, without any extra expenses, except in the first cost of the plant. No mode of burning red charcoal in meilers or pits has yet been found. Where, however, as in many or most parts of this country, the charring is done in kilns, only a very simple arrangement is needed for conducting the process so as to obtain the red charcoal.

The gases developed by the use of this material in blast furnaces are made available, together with the rest of the furnace gases, and thus not a small saving of fuel is effected. The relation of the total saving to the amount of fuel now used may be seen from the following figures, taken from Wedding's Report on the iron manufacture in the United States.

Per 1,000 kg. of iron, say 1,500 kg. of charcoal are used, or for the production of charcoal-iron in 1873–75, an average of 520,000 tons of iron, 780,000,000 kg. (1,560,000,000 lb.) of charcoal, on which were lost at least ⅔ of the heating value, equal to 1,312,000,000 kg. (624,000,000 lb.) or about 31,200,000 bushels, to produce which at least 50,000 acres of woodland are required.

This figure may appear small in a country where the waste is generally counted by millions, but if we consider this amount as the interest of say 1,500,000 acres of woodland under well-regulated forest management, with a turn of thirty years, we see that by this loss a capital of at least $3,000,000 is taken out of circulation, besides what has been spent unnecessarily in the greater cost of the smaller product of charcoal, which represents another $2,000,000 lost yearly.

I am informed that some of the charcoal furnaces at Lake Superior em-

ploy coal not completely charred, and obtain unusually good economy of fuel; but I am not aware that any precise account has been published. It would be very beneficial to other districts, and perhaps to their own, if the Lake Superior operators would make public all the particulars of this practice. Perhaps it would be found that they have stumbled upon an imperfect *charbon roux*, and that by its more systematic use they could achieve still better results.

Another fact which points in the same direction is the common practice, at American charcoal furnaces, of throwing in at the tunnel head, not merely half-burned brands, but wood. It is probable that the latter added in small quantities becomes red charcoal before reaching the tuyeres; but the economy of performing the charring in the furnace may be doubted for several reasons.

DISCUSSION.

The PRESIDENT remarked that he had seen wood charged in Canada charcoal blast-furnaces to the extent of half the fuel, and remembered that Mr. Thos. McFarlane, a member of the Institute, had published, some ten years ago, figures to show that this practice secured a gain in economy. He had supposed that in that case the wood became half-charred; in fact, a sort of *charbon roux* in its descent through the furnace.

Mr. WILLIAM C. KENT inquired whether Mr. Fernow could say whether actual gains had been reported from the use of red charcoal in the blast furnace in Germany. If, as stated, this material contained tar and other hydrocarbons, would it not be analogous to bituminous coal, which requires to be coked before use, because the vaporization of these hydrocarbons in the furnace causes a direct loss of heat?

Mr. FERNOW replied that he knew of one furnace in the Hartz which employed the *charbon roux* in iron smelting. In the manufacture of gunpowder it was decidedly preferred.

Prof. T. M. DROWN said that in a paper by Prof. JOHN A. CHURCH on *The Velocity of Gases in the Blast Furnace*, published in Vol. II. of the *Transactions*, the consumption of charcoal at various Lake Superior furnaces was given; and in a paper by Mr. T. WITHERBEE, published in Vol. IV., the amount of green wood which that gentleman was able to throw into a charcoal furnace was given. Mr. JOHN BIRKENBINE remarked upon the great importance of this subject, not merely with respect to the waste of material, but also with respect to the climatic changes which the removal of the forests caused. The rate at which this devastation went on in the charcoal iron industry is evident from the fact that, according to calculations which he had made, a charcoal furnace clears annually two acres of woodland for each bushel of coal consumed per week.

Mr. R. W. RAYMOND said he remembered a conversation with Prof. CHURCH, the author of the paper referred to by the Secretary, in which the peculiar charcoal used by the Lake Superior furnaces was discussed, and Prof. CHURCH expressed the decided opinion that it gave results in the blast furnace superior to ordinary black charcoal. There was no doubt that this Lake Superior charcoal was in some way prepared so as to retain a part, at least, of the hydrocarbons of the wood; and the favorable verdict of experience with it would perhaps serve to answer the objection which Mr. KENT had suggested.

Under our institutions, and at the present time, it would be extremely difficult to devise or enforce general restrictive laws as to the waste of forests. The Government might and should protect its own lands from robbery; but as to private property, so long as cleared land was actually worth more in the market than woodland (as was still the case in many instances), it might be said that the time for restricting by law the cutting down of timber had not arrived. Certainly it was a more immediate necessity to show to citizens themselves that they could utilize with profit a larger part of the product of the forest. He had been informed that in the State of New York there were a number of establishments distilling wood for the manufacture of pyroligneous and acetic acid, and throwing away the charcoal for want of a purchaser.

Mr. BIRKINBINE asked if the charcoal so used was equal in quality to that burned in pits.

Mr. RAYMOND said it was not. The kilns produced a larger quantity of inferior quality.

Mr. GRIDLEY said that pits produced about 100 bushels from 2½ cords of wood, while kilns required for the same product but two cords. He would like further information as to the method of manufacturing the red charcoal.

Mr. FERNOW said that the principle in preparing red charcoal in kilns was to have a separate outside source of heat, which is sent through the charge by means of iron flues of by clay flues at the bottom of the kiln, through which the heated air comes in contact with the charge by means of openings. Precautions must also be taken to allow the condensed water and acid to escape from the bottom. The temperature at which the formation of the red charcoal takes place is 350° Centigrade.

MANGANESE PIG IRON.

Mr. R. W. RAYMOND read a note on "Manganese Pig Iron," as follows:

The manufacture of ferro-manganese, in the blast furnace, having been the subject of considerable attention in the Institute, I beg to put on record a contribution to the discussion from a quarter hitherto not directly represented—namely, the St. Louis furnaces, near Marseilles, in France, belonging to a company of which M. JORDAN, a member of this Institute, is Managing Director. The statements, about to be briefly given, have been published, I understand, but not in full, in this country. These furnaces commenced in 1862 to manufacture specular pig (*fontes à facettes*) containing from three to six per cent. of manganese. In 1864 the regular production of spiegeleisen (*fontes miroitantes*), containing from seven to ten per cent. of manganese, was inaugurated. At that time the Rhine was the only locality of this manufacture, and the Bessemer works of England and France obtained from Germany all their spiegel.

From 1864 to the present time, the St. Louis furnaces have been advancing steadily the percentage of manganese in their product.

From ferro-manganese of 30 per cent. they had arrived two years ago at a product containing 70 to 75 per cent., and for some time past they have been turning out what, as M. JORDAN remarks, may fairly be termed *fonte de manganese*, or manganese pig, instead of iron, since the percentage of iron it contains is not more than 8·5, while the percentage of manganese is 85, or ten times as great. This very high grade material has a peculiar appearance, entirely different from that of ordinary cast-iron or spiegel. It is granular and steely gray in color. The following analyses communicated to the *Société des Ingénieurs Civils* by M. JORDAN, shows the composition of various products of the St. Louis furnaces:

	Lamellar Pig.	Spiegeleisen.		Ferro-Manganese.		Gray Steely Pig.
		A	B	A	B	
Iron	90·070	*83·958	*75·562	*54·436	8·550	*89·029
Manganese	4·640	10·930	18·500	39·900	84·960	3·310
Total carbon	3·627	4·410	5·750	5·450	5·700	4·900
Silicon	1·325	0·690	0·168	0·186	0·660	2·740
Sulphur	0·048	0·010	0·005	0·008	0·035	0·006
Phosphorus	traces	0·002	0·015	0·020	0·005	0·015
	99·710	100·000	100·000	100·000	99·910	100·000

These analyses, at least in the absence of details as to the method of manufacture, do not reveal any law as to the percentage of other ingredients besides manganese and iron. The total carbon is practically the same for 18 per cent manganese as for 85 per cent. This might perhaps be inferred from the chemically similar behavior of manganese and iron. The increase in the proportion of silicon in the B ferro-manganese might be ascribed to the very high temperature of reduction and fusion; but spiegeleisen A, containing only 10·9 per cent. of manganese, is even more silicious, though the intervening products are notably less so. The variations in phosphorus are scarcely of practical importance, since the amount of high-grade spiegel or ferro-manganese added in the converter or open hearth is not large enough to contribute, from material so nearly free from phosphorus as this, any appreciable amount to the steel. In fact, all these analyses show less phosphorus than the metal bath before the addition of spiegel usually contains. Much higher proportions of phosphorus might easily be carried and are carried by ferro-manganese without sensible detriment.

M. JORDAN says that the reduction of oxide of manganese is difficult, requiring very high temperatures and a considerable consumption of fuel. A furnace producing 50 to 60 tons daily of the "steely gray pig" referred to in the above table, could produce of the manganese pig not more than 20 to 24 tons.

In conclusion, Mr. RAYMOND expressed a desire to hear from some of the members concerning the reasons of the preference shown by American steel-makers for spiegeleisen containing not more than 20 per cent. of manganese, although the higher grades undoubtedly permit a more perfect control of the process, particularly as to the amount of carbon, permitting, indeed, the manufacture of ingot metal lower in carbon than could possibly be made by the use of spiegel. He knew that there were practical reasons for the preference of spiegel, but would like to have them explained by others more perfectly acquainted with the subject than himself.

DISCUSSION.

Mr. HOLLEY said that while he could not then give the costs of the spiegels of various grades, he knew that in the Bessemer rail manufacture certainly those low in manganese were the cheapest—provided the steels were malleable with ordinary percentages of manganese. Some iron produced a steel which would crack in rolling unless a high percentage of manganese was present. One reason why the low manganese spiegels are cheapest for ordinary rail steels is that the large amount of iron they contain is reproduced as steel with the slight loss due to melting, while the iron that forms the bath has to stand the loss of conversion also. Ferro-manganese, rich in manganese, is necessarily used for soft steels in both the open-hearth and in the converter. These steels—boiler plate for instance—must be low in carbon. Adding low spiegel enough to give them the manganese that will make them malleable would give them too much carbon. One other thought occurs in this connection. Melting spiegels by the barbarous methods usually employed in our Bessemer works, oxidizes the manganese largely, and the richer they are in this substance, the greater its loss, as manganese is the most oxidizable of all the ingredients. We melt the spiegel in ordinary reverberatorie or in cupolas which is less, but quite wasteful. Mr. FRITZ has the best system of melting—a gas furnace—but even this oxidizes some 2 per cent. of the manganese in ordinary spiegel. At West Cumberland, England, Mr. HOLLEY saw a truly scientific arrangement—a cage containing the pre-heated spiegel, just over the mouth of the vessel. When the blowing is completed the spiegel is dropped out of the cage into the vessel, and while the vessel is turning down, it is thoroughly mixed with the bath. When the spiegel is thrown into the vessel after turning down, it gets entangled in the slag and is likely not to be thoroughly incorporated with the bath. This improvement ought to be generally adopted.

Mr. FRITZ said that at Bethlehem ferro-manganese was thrown into the vessel and so was not wasted by melting. When ordinary spiegel was used, this was not done, on account of the difficulty of pre-heating the larger quantity required, so as not to chill the bath.

WEDNESDAY SESSION.

The Institute met in the Hall of the Franklin Institute. Mr. O. J. HEINRICH read a paper on "The Mesozoic Formation in Virginia," which was discussed by Dr. HUNT and others. We shall give an abstract of this paper and debate hereafter.

PULVERIZED ZINC.

Dr. T. M. DROWN read a paper "On Pulverized Zinc and its Uses in Analytical Chemistry," as follows:

Zinc is, as is well known, very brittle at a temperature of about 210° C. (410° F.), and may then be readily pulverized in a mortar. By sifting it may be obtained of uniform grain. I have been accustomed to prepare products passing through 40, 60 and 80 mesh sieve, and also by bolting through a fine handkerchief.

The principal analytical uses to which I have hitherto applied this material are to the reduction of iron directly from the ore, by heating it with the pulverized zinc, and the reduction of ferric to ferrous compounds in solution.

In the first case the pulverized ore, 0·5 grain or less, is intimately

mixed with about ten times its weight of the pulverized zinc (the finer the zinc the better), in a porcelain crucible, and this mixture is covered with about the same amount of zinc. The crucible is then heated at the top of the flame of a Bunsen burner, at a dull red heat, for about ten minutes. The crucible should not be covered. When cool, the crucible, with its contents, is placed in a flask and treated with hot dilute sulphuric acid, and brought quickly to a boil. The zinc and reduced iron are dissolved in a few minutes, and the flask is then tightly corked and allowed to cool. When cool, the iron is directly titrated by permangate of potash.

It has been found necessary to roast ores containing organic matter in the crucible before adding the zinc, otherwise the final solution will be too dark to titrate. It was also found that in cases where there was no organic or carbonaceous matter in the ore, that the solution was very dark; and it was found, after a number of experiments, that this blackening came from the decomposition of the carbonic acid from the combustion of gas. This has been obviated by making a thick coating of very fine zinc, or by a cover of pulverized borax glass, which fuses, and protects the mixture beneath from the action of the products of combustion of the gas.

The following results have been obtained from this process:

In a brown hematite.

By zinc method.....48·63 per cent., 48·72, 48·71, 48·74, 48·83, 48·69; mean, 48.72
By reduction by hydrogen (after previous oxidation with oxygen gas) at a red heat.48·74

In a magnetite.

By zinc method.....67·19, 67·06, 67·59; mean, 67.28
By hydrogen method.....67·33

The use of this pulverized zinc of somewhat coarser grain is very advantageous in the reduction of iron to the ferrous condition in solution. Any one who has used granulated or plate zinc knows of the trouble often experienced in effecting complete reduction and of dissolving the last traces of the zinc. The large surface exposed by the granulated zinc insures complete reduction in a short time, and the small size of the grain is a guarantee that its final solution will not be tedious. The practice is to add to the ferric solution, in a flask, 5 grains of 40-mesh zinc. There should be but a very small excess of sulphuric acid, so that at the end of an hour or two only about half of the zinc will be dissolved. Then sulphuric acid is added, and the solution quickly boiled, and the process conducted as above. I have found the pulverized zinc useful in treatment of sulphurets to render them soluble in hydrochloric acid, and I have other experiments in process in treatment of ores and minerals. It is probable, too, that other metals in finely divided form, as iron reduced by hydrogen, may have uses in analytical chemistry.

Dr. HUNT and Mr. RAYMOND made remarks in recognition of the great saving in labor and time in the laboratory effected by the process described in the paper, and thanking the author for its communication.

FIRE CLAYS OF NEW JERSEY.

Prof. J. S. SMOCK read a paper on "The Fire Clays and Associated Plaster Clays, Kaolins, Felspars and Fire Sands of New Jersey," of which, together with the interesting description which followed, we shall give a summary hereafter.

BLUE TRACINGS.

A note by Mr. P. BARNES, on "The So-Called Blue Process of Copying Tracings," was read, and will appear in our next issue.

WEDNESDAY AFTERNOON.

The Institute met at the Academy of Natural Sciences.

Papers and communications were presented as follows:

"The Nickel Ores of Oxford, Quebec, Canada," by W. E. C. EUSTIS, A. B., S. B.

"Note upon the Drainage of a Flooded Ore-Pit at Pine Grove, Pa.," by J. BIRKINBINE.

"On the Strength of Wrought Iron, as Affected by its Composition and by its Reduction in Rolling," by A. L. HOLLEY.

"On an Improved Tripod for Surveying Instruments," by J. H. HARDEN.

"On a Suspended Signal for Surveying," by Prof. H. S. MUNRO.

After some announcements from the Museum Committee, the session was adjourned.

WEDNESDAY EVENING.

In the evening the members of the Institute were entertained at the rooms of the Penn Club by the Engineers' Club, of Philadelphia.

THURSDAY MORNING.

On Thursday morning the final session was held at Memorial Hall, in the Centennial Grounds. The following papers were read:

"On Some New Points in the Geology of Lancaster County, Pa.," by Prof. P. FRAZER, Jr.

"On Red Charcoal in the Blast Furnace," by Mr. WM. KENT, of Pittsburg.

"On Some Minerals from Sterling Hill," by Prof. G. A. KOENIG.

"Note on the Cost of Construction of the Converting Works of the Edgar Thomson Steel Company, of Pittsburg, Pa., 1873–75," by P. BARNES.

"Index of the Official Geological Reports of the Various States and Territories," by Prof. F. PRIME, Jr.

"The Late Workings of the Mariposa Estate in California," by CHAS. M. ROELKER.

"On a Filter for Boiler-water," by P. BARNES.

"Memoranda Showing the Percentage of the Different Expense Accounts in Mining Hematite Ore at Manhattan Mine, Sharon Station, N. Y.," by J. F. LEWIS, Amenia, N. Y.

A report of progress from the Museum Committee was made by Mr. J. S. ALEXANDER, the Chairman of the Committee.

Resolutions of thanks to the American Philosophical Society, the Franklin Institute, the Academy of Natural Sciences and the Pennsylvania Museum, for the accommodations tendered to the sessions of the Institute; to the Industrial Exhibition Company, to the Pennsylvania Academy of Fine Arts and the Engineers' Club, for courtesies and hospitalities.

The SECRETARY announced that the arrangements for the May meeting were in the hands of a special committee of the Council, and it was voted that the Council be authorized to change the date of said meeting, if desirable.

Various notices of amendments to the rules, to be acted upon at the May meeting, were then given.

[We shall give hereafter such further portion of the proceedings as we deem of interest to our readers.]

After a few congratulatory remarks from the President the meeting was adjourned.

The following is the list of members and associates elected at the meeting:

MEMBERS.

Prof. Henry T. Bovey, McGill University, Montreal.
R. H. Bulley, Chemist, Bolton & Myers & Co.'s Steel Works, Canton, Ohio.
Charles B. Davis, Mining Engineer, Coalburg, W. Va.
E. M. Ferguson, Coke Manufacturer, Pittsburg, Pa.
H. C. Hahn, Mining Engineer, Wyandotte, Mich.
Alexander Hamilton, Manager Rolling Mills of Cambria Iron Company, Johnstown, Pa.
Emery M. Hamilton, Mining Engineer, New York City.
Andrew Kloman, Chief Engineer and Manager Union Iron Mills. Pittsburg, Pa.
L. G. Lawrence, Civil Engineer, New York City.
T. R. Morgan, Mechanical Engineer, Alliance, Ohio.
M. B. Patch, Chemist, Detroit & Lake Superior Copper Company, Houghton, Mich.
T. W. Robinson, Chemist, Otis Iron & Steel Company, Cleveland, O.
Horace G. Young, Engineer, Trinidad, Colorado.

ASSOCIATE.

Levi Holbrook, New York City.

Mr. JOHN BIRKINBINE then read the following paper:

NOTES UPON THE DRAINAGE OF A FLOODED ORE-PIT AT PINE GROVE, PA.

In close proximity to the Pine Grove furnace (charcoal), in Cumberland County, Pa., is a large deposit of superior hematite ore, which has been operated for a number of years, and from which many thousand tons of ore have been taken. In July 1874 the furnace was blown out and work on the ore-bank was suspended, the machinery for draining the mine being removed, with the exception of a plunger pump, 18 in. in diameter and 66 in. stroke. As this pump was not operated, the pit rapidly filled with water, and no steps toward its reclamation were taken until November, 1877. At this time, the pit was a pond at the base of the mountain, covering an area of perhaps 4 acres, and some 70 ft. deep. As the pumps, rods, etc., had been submerged for over three years and partially buried in the mud washed down from the bank, and as it was the intention of the Company to change its position, it was determined to use a temporary method of draining the pit until the pump could be reached and moved to the location selected.

By means of an old adit about 10 feet of the surface water was drained off into a creek near by, which reduced the area to about 3 acres and left some 45,000,000 gallons to be pumped from the excavation. Springs discharged into the ore-pit 250 gallons per minute, which also had to be removed: and as this amount would undoubtedly increase as the water sank, provision was made for the removal of nearly double that quantity. Estimates were therefore made for removing 60,000,000 gallons at the rate of 1,500,000 gallons per day. To accomplish this a Heald and Cisco pump, operated by an oscillating engine, was procured and placed upon a raft. Steam was furnished by four 36 in. plain cylinder boilers, 36 ft. long, and carried from them by 2½ inch tubing 125 to 200 ft. long, and 50 ft. of gum steam-hose.

The discharge from the pump was conveyed through a 7 in. canvas hose from 90 to 125 feet long to the surface, and discharged into a pool provided with a weir. The work of draining the mine was commenced November 28, 1877, and bottom was reached January 14, 1878, 56½ days being required. From this time five Sundays should be deducted, as the pump was not run on the Sabbath until the influx was so increased as to cause serious detention. Besides this, 76 hours were lost by stoppage to make connections, repair hose, etc. The actual time the pump was in operation was 47¾ days, and over 66,000,000 gallons of water were discharged. Of the time employed in draining the pit, 5·2 per cent. was lost in making the necessary changes and repairs. The average discharge of the pump was at the rate of 1,600,000 per day.

The machinery consisted of a centrifugal pump, with a hollow arm piston, 24 inches in diameter and 3½ inches face, revolving on a horizontal shaft, to which was fitted a 15-inch pulley, and an oscillating engine, driving a band wheel 6 ft. in diameter by a gum belt. The engine, pump, belt, etc., weighed less than 3 tons. The revolving piston had 5 hollow, tapering, curved arms, each having an 8-inch opening into the central chamber, and an opening 2¼ × 2¾ inches at the periphery. The action of the pump was to draw the water through a 7-inch suction pipe into this central chamber and discharge it at the circumference into a 6-inch pipe, and thence into the canvas hose above described. Although the steam pipe was protected, there was considerable loss owing to its length; and it was impossible to work the pump at the speed at which it could theoretically operate to the best advantage; that is, when the velocity of the periphery of the piston is equivalent to the velocity of a body falling once and a half the height of the lift. the allowance of 50 per cent being for friction and breakage.

The speed attained approximated the theoretical velocity until the lift exceeded 30 ft.; then the difference between them increased. At 45 ft. and above, the speed attained did not exceed 575 revolutions per minute, whereas the calculated speeds are:

For 45 ft. lift, 630 revolutions per minute.
For 55 " 690 " "
For 65 " 735 " "

The latter speed is 4,600 feet per minute.

The following table gives various data of interest to engineers, as showing the performance of a centrifugal pump:

Lift in Ft.	Pressure of Steam at Boilers.	Revolutions of Pump.	Gallons Discharged per Minute.	Coal Consumed per Day.	Theoretical Velocity of Pump.	Duty, Without any Allowances. Million.
15	55	400	1,200	5,100	450	4·23
25	60	500	1,200	4,500	520	8
35	65	525	1,200	5,200	580	9·7
45	65	575	1,300	5,100	630	13·76
55	70	575	1,100	4,900	690	14·8
65	70	575	1,000	5,100	730	15·3
*40	65	525	1,200	5,200	....	10

*Average.

EFFECT OF INJECTING SUPERHEATED STEAM ABOVE THE FIRE IN BOILER FURNACES.

[Report of the Board of Officers of the French Navy on the Bourdon system of injecting superheated steam above the incandescent fuel in a boiler furnace. Translated from the "*Memorial du Genié Maritime*" of August, 1859, for the ENGINEERING AND MINING JOURNAL, by Chief Engineer Isherwood, U. S. Navy.]

A Board, consisting of Messrs. Cras, Director of Naval Construction; Laffou-Ladébat, Captain of line-of-battle ship, and Mangin, Naval Engineer, was ordered on the 29th of October, 1859, by the Council of Works of the French Navy, to examine Mr. H. Bourdon's smoke burning apparatus at the pasteboard factory of Mr. Marette, near the bridge of Flanders.

The boilers to which the apparatus was applied being out of use for repairs, the examination did not take place until the 22d of November following, when the whole was submitted to the Board by the inventor, who also furnished all the necessary information.

The apparatus was attached to two high pressure boilers, each consisting of three combined cylinders set in brick masonry, and was of the following description:

An iron pipe of very small diameter carried the steam from the steam-drum of the boilers to the front of the furnace, entering the latter near the side of its door at the level of the coal within, and delivering the steam into a faggot of tubes situated in the masonry of the furnace. From this faggot of tubes a second pipe led to a rectangular box of thick iron placed across the furnace above the top of its bridge-wall. In the side of this box facing the fire, is a large number of very small holes with diverging axes which spread out fan-like above the coal on the grate.

The steam taken by the pipe from the steam-drum of the boilers is first superheated in the faggot of the tubes lying in the hottest part of the masonry of the furnace, and is then carried to the box from which its pressure violently projects it in fine streams over the whole surface of the incandescent fuel. Cocks, placed at proper points of the apparatus, control the admission of the steam, and drain off the water of condensation when the boilers go out of use.

According to Mr. Bourdon's theory, the superheated steam on coming in contact with the incandescent fuel, decomposes into oxygen and hydrogen, thus furnishing the furnace with a large contingent of pure combustible gas, having a maximum calorific power, whence results an extremely rapid and perfect combustion of all the combustible elements, with a total absence of smoke.

The Board found that Mr. Bourdon's apparatus did produce an extraordinary activity in the furnace; that the flame, instead of being long, undulating and more or less smoky, became, when the steam was injected, short, dazzling and darting like jets from a blow-pipe; that the draught of the boiler was considerably increased, and that, finally, the furnace showed no trace of smoke, the gases of combustion escaping from the chimney being colorless and only visible, with difficulty, at the moment a fresh charge of coal was thrown in.

But, notwithstanding these positive facts, which seem to show that the utilization of the combustible was as complete as possible, the Board admits neither the theory of Mr. Bourdon, nor the exaggerated consequences he deduces from it. The decomposition of the steam, if it should decompose, would absorb as much heat as the recombination of its constituents could produce; while the combustible elements of the coal remaining as before, would give the same result. And, as the decomposition of the steam in contact with the glowing coal absorbs as much heat as the recombination of its elements furnishes, the temperature of the furnace would not be changed by this double effect. Nevertheless, it is certain that the furnace becomes, when the apparatus is in action, perfectly smoke-burning, and that its appearance is totally changed; but the Board is of opinion that the phenomena produced are simply a mechanical result, and can be explained without resource to more or less paradoxical chemical theories.

It is well-known that about half the oxygen admitted to a furnace escapes without assisting the combustion. If, then, by any kind of process, this free oxygen could be mixed with any imperfectly-burnt gas, it would appear that the combustion of this gas should be perfected. Now the apparatus of Mr. Bourdon produces exactly such a result. The fine streams of steam escaping under strong pressure from the box into the oxygen and combustible gases, stir them together and thus produce mechanically a complete mixture. The atoms of oxygen which would have passed off without being utilized, are now brought into intimate contact with the unburnt gas in the presence of incandescent carbon, that is to say, the two gases are mixed at a high temperature, and there is necessarily combination; so that if the number, the velocity and the direction of the steam-jets are properly proportioned, all the solid and gaseous elements of the coal will be consumed.

It is likewise evident that for the production of this result the steam should be superheated, so as not in the least to cool the furnace; also, that the streams of steam should be very fine and close together so as not to introduce an unnecessarily large quantity of inert matter, which, like the nitrogen of the atmosphere, interposes, between the molecules of the gases to be combined and renders their combustion slow.

All these conditions are perfectly fulfilled by the apparatus of Mr. Bourdon, which appears to the board the simplest and most efficacious of all those (and the number is very great) which have been proposed up to the present for the purpose of rendering combustion complete and preventing the formation of smoke. As to whether there is any economy of fuel realizable by this system, the board has not had the means of ascertaining. It is declared at the factory of Mr. Marette, that the application of Mr. Bourdon's apparatus allows the use of an inferior quality of coal with a reduction of 15 per centum in the weight consumed. This gain does not appear an exaggeration, but it requires verification.

To sum up: The apparatus which the Board saw in operation near the bridge of Flanders completely burns the smoke, and appears to effect a perfect combustion of the solid and gaseous elements of the coal; there is reason also to believe it economical. It is very simple, and can be applied without difficulty to either land or marine boilers. It is very easy to manage, and it notably increases the force of the draught. The navy is interested in its adoption, provided repeated experiments on a proper scale shall show the permanence of the good results already obtained and the reality of the economy claimed; consequently, the Board recommends a complete trial to be made of the Bourdon system, in one of our navy yards, for the purpose of determining exactly its practical value, including an experiment with the same apparatus on air, injected at the same temperature and under the same pressure as the superheated steam. A comparative trial of this kind, which need be of but short duration, could probably be made at small cost, and would solve the theoretical problem.

In closing this report, the Board would call attention to the fact that the patents of which Mr. Bourdon is owner seem to be exactly the same as those of Mr. Thierry, whose apparatus the Council of Works has recently had examined. All these patents originally belonged to Mr. Hazard, a chemist, and apparently the first who conceived the idea of injecting superheated steam above the incandescent fuel in a furnace.

A DECIMAL GAUGE FOR SHEET METAL AND WIRE.

By Robt. Briggs, C. E.

(*Continued from page* 128.)

[Abstract of a paper published in the Journal of the Franklin Institute, December, 1867.]

At this point it is only necessary to refer to the scale and to the tables of comparison. So far as relative difference between pairs of numbers is concerned, inspection of the column of Birmingham gauges in Table I. will show that between Nos. 000 and 4 – 6 spaces, the decrease for each size is $\frac{1}{10}$, nearly, and the same between numbers 8 and 12 – 4 spaces, and also the same between Nos. 20 and 30 – 10 spaces; so that 20 spaces out of the 39 follow, with close approximation to exactness, the rule of uniform reduction of one-tenth. The ideal perfect gauge of the workman may be fairly accepted as having this ratio of differences! The adoption of this ideal involves the regulating of values which the true decimal gauge effects, when the substitution of new values in the scale at the places of discrepancy necessitates three or four more numbers.

The plate accompanying this paper, represents the Decimal, Birmingham and American gauges graphically, showing the irregularities of the Birmingham gauge as derived from figures given in the text books (the authority of which figures is *Holtzapfel's Mechanical Manipulation*, 1846), but some allowance must be made for inaccuracy of measurement of the smaller gauges, where the decimal values are carried out to only two, and below No. 32 to only one figure. The enlarged diagram on the plate, gives in dotted line a more correct view of the Birmingham gauge from No. 30 to 36.

TABLE I.

Comparison of Decimal, Birmingham and American Wire Gauges.

Dimensions in English Inches, with Correspondiug Dimensions for Decimal Gauge in Centimetres.

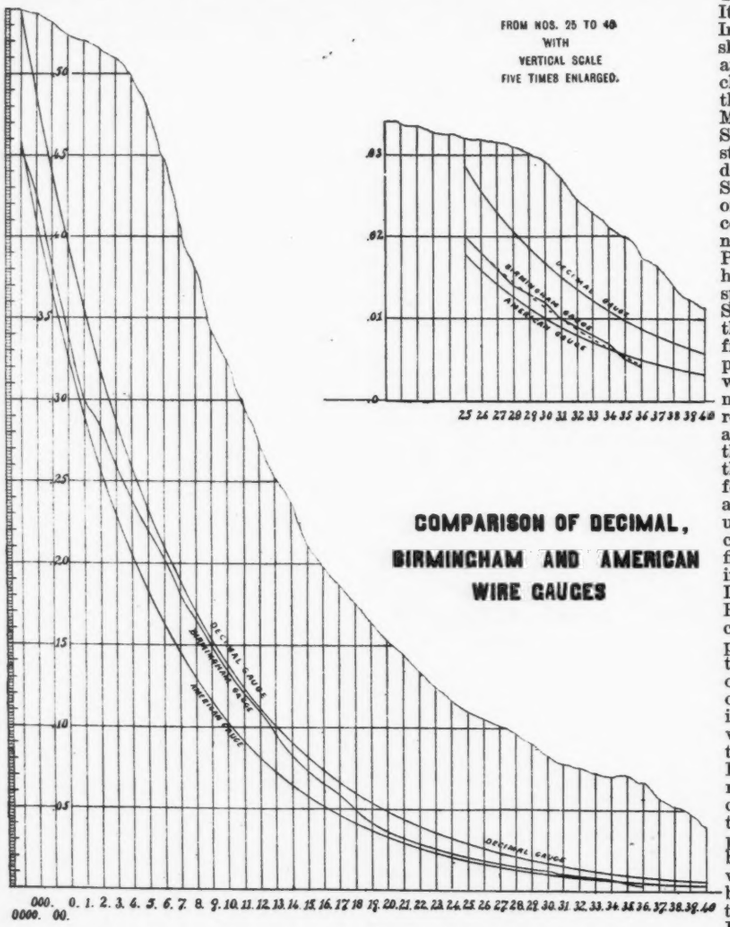
No. of Gauge.	Decimal Gauge. Centimetres.	Decimal Gauge. Inches.	Birmingham Gauge. Inches.	American Gauge. Inches.
0000 = —3	1·3717	0·5401	0·454	0·46
000 = —2	1·2346	0·4861	0·425	0·4096
00 = —1	1·1111	0·4375	0·38	0·3649
0 = 0	1·	0·3937	0·34	0·3249
1	0·9	0·3543	0·3	0·2893
2	0·81	0·3189	0·284	0·2576
3	0·729	0·2870	0·259	0·2942
4	0·6561	0·2583	0·238	0·2043
5	0·5905	0·2324	0·22	0·1819
6	0·5314	0·2092	0·203	0·1620
7	0·4883	0·1883	0·18	0·1443
8	0.4305	0·1695	0·165	0·1285
9	0·3874	0·1525	0·148	0·1144
10	0·3487	0·1373	0·134	0·1019
11	0·3138	0·1236	0·12	0·09074
12	0·2824	0·1112	0·109	0·08081
13	0·2542	0·10008	0·095	0·07196
14	0·2288	0·09007	0·083	0·06408
15	0·2059	0·08106	0·072	0·05707
16	0·1853	0·07296	0·065	0·05082
17	0·1668	0·06566	0·058	0·04526
18	0·1501	0·05909	0·049	0·04030
19	0·1351	0·05318	0·042	0·03589
20	0·1216	0·04787	0·035	0·03196
21	0·1094	0·04307	0·032	0·02846
22	0·09848	0·03877	0·028	0·02535
23	0·08863	0·03489	0·025	0·02257
24	0·07977	0·03140	0·02	0·02010
25	0·07179	0·02864	0·018	0·01790
26	0·06461	0·02544	0·016	0·01594
27	0·05815	0·02289	0·014	0·01419
28	0·05233	0·02060	0·013	0·01264
29	0·04710	0·01854	0·012	0·01126
30	0·04239	0·01669	0·010	0·01003
31	0·03815	0·01502	0·009	0·008928
32	0·03434	0·01351	0·008	0·007950
33	0·03090	0·01217	0·007	0·007080
34	0·02781	0·01095	0·005	0·006304
35	0·02503	0·009856	0·004	0·005614
36	0·02253	0·008870		0·005000
37	0·02028	0·007983		0·004453
38	0·01825	0·007185		0·003965
39	0·01642	0·006466		0·003531
40	0·01478	0·005819		0·003144

Returning to the question of value to be assumed for the unit of thickness, there was another metric value which presented some points of merit. The solid volume of a sheet measuring 1 square meter, and having a millimeter of thickness, is equivalent to a cubic decimeter, again represents the liter or measure of capacity (= 1·05656 American quarts = 0·88025 English quart) and the kilogramme of water (= 2·204737 avoirdupois pounds). If the millimeter were taken for the unit, the "0" of the gauge would be about No. 20 of the Birmingham gauge. From this unit the numbers would range upwards and downwards; in the upward direction "minus" 23 would be a little less than the Birmingham 0000 in thickness. With this unit of thickness as the starting point, the weight of sheets of iron, steel, copper, brass, or other metal corresponding to it, per meter square of surface, represents the specific gravity of the material. That is, as a liter of water weighs one kilogramme, the meter square of iron of one millimeter in thickness, *having the same cubic volume*, weighs 7·77 kilogrammes, and with other metals the same relationship to the comparative weight of water for sheets one meter square by one millimeter in thickness, exists. The objection to this value is the disturbance of the relationship of numbers to thicknesses of sheets, or diameter of wires, which is now so positively fixed in the minds of the "trade." It makes no real difference whether the scale of figures runs up or down. No unit can be taken which will be so large or so small that it can be adopted as a starting point from which to proceed upwards or downwards only. Certainly the thickness of 0·039 of an inch is not so small that negative or descending numbers will not be a necessity, while the number 0·39 of an inch is in fact so large, that, as a scale of numbers, the sizes above zero are not to be classed as merchantable. This last qualification being one of the main conditions of sheets and wire, which are measured by a gauge. And if the unit be taken at a centimeter in place of a millimeter, the relation of weights of a meter square of sheets to specific gravities is yet preserved to all intents and purposes, being only increased by multiplying by ten; the meter square sheet of iron, which has the thickness of a centimeter, weighing 77·7 kilos., while its specific gravity is 7·77.

On the whole, the adoption of the centimeter as the unit of thickness, which shall represent zero in the exponential scale of numbers, seems to meet at once the demands of conformity with natural constants, and also with the habitual *thought* of the metal and wire workman.

A decimal progressive scale could be made in either of two ways—it can either increase or decrease by a decimal rate. Thus, if one-tenth is added each time to a series of numbers, the retrogade steps will be the deduction of one-eleventh, and on the other hand if one-tenth be deducted each time, to form a similar series, the increase of each number will be one-ninth added to that below it. Either of these ways is equally advantageous in use for computing, but the one-tenth of addition will give nearly 24 steps in passing from one to ten, while the one-tenth of deduction gives nearly 22 steps in passing from ten to one. This small difference of number of steps would have little effect in the decision as to which system to follow, except that the Birmingham gauge has from 18 to 20 steps in the passing from any of its values to those ten times as great. [The "American" gauge gives very nearly 20 steps in this change of values, but as it avoids one-ninth deduction (or one-eighth addition) by the least of difference, so also it avoids the equal stepping off of the space of two-fold increase with 20 steps by a small fraction.] As it has been shown before that the Birmingham gauge has a large portion of its spaces at one-tenth deduction, and as 22 steps in ten-fold increase or decrease most nearly correspond to the known gauge of commerce, it would appear that $\frac{9}{10}$ is a more proper basis for the new guage than $\frac{1}{11}$, and the plate and tables follow $a(\frac{9}{10})^N$ as the most suitable base.

(TO BE CONTINUED).



LOCOMOTIVE POWER ON THE GREAT EASTERN.—In the second half of 1877, the aggregate distance run by trains upon the Great Eastern Railway (including mileage run for other companies and empty carriage trains) was 5,468,389 miles. The corresponding distance run by trains in the corresponding period of 1876 was 5,304,220 miles. Of the 5,468,389 miles run in the second half of 1877, 3,433,848 miles were run by passenger trains and 2,034,541 miles by goods trains. The whole outlay for locomotive power in the second half of 1877 was £209,757, as compared with £204,206 in the corresponding half of 1876. In the second half of 1877, £9,400 was charged for new engines; in the second half of 1876, no corresponding charge was made.—*Colliery Guardian.*

A HISTORY OF TUNNELING.

Continued from page 115.

[Extracts from advance proofs of *A Treatise on Tunneling, Explosive Compounds and Rock Drills*, by Henry S. Drinker, Mining and Civil Engineer. Published by John Wiley & Sons, New York. (Copyrighted.)]

Tunneling, however, of course did not become common until the introduction of steam multiplied railways. The first locomotive* used in this country was the "Stourbridge Lion." It was built by Foster, Rastwick & Co., of Stourbridge, England, and was imported by the Delaware and Hudson Canal Co., who, in 1828, built a road (in Pennsylvania) from their coal mines at Carbondale to the terminus of their canal at Honesdale, and on this road the "Stourbridge Lion" was tried August 8, 1829. It was found to be too heavy for the roadway, was housed up, and finally taken to pieces and destroyed.†

It seems that the first charter in the United States for a public railroad was granted by the Legislature of New Jersey. In 1811, Col. John Stevens, of Hoboken N. J., presented a memorial to the Legislature to authorize a railroad in New Jersey, and in 1815 a law was passed incorporating "The New Jersey Railroad Company," authorizing a road from Trenton to New Brunswick. It was not built, however. In 1820, Col. Stevens built a short road, at Hoboken, as an experiment. The next charter was one granted by the State of Pennsylvania, on March 31, 1823, to John Stevens and others, to construct a railroad from Philadelphia to Columbia, on the Susquehanna River, a distance of about 80 miles. Among the corporators were Horace Binney and Stephen Girard, of Philadelphia. John Stevens, however, was the master-spirit of the enterprise. Stevens was authorized by the charter to charge tolls on freight not to exceed 7 cents per ton per mile on that going west, and 3½ cents per ton per mile on that going east. The road was "not to rise above an angle of ten degrees with the plane of the horizon," and the charter was to continue in force for ten years. Nothing appears to have been done under this charter; a second charter, which repealed the first, was granted in 1826, incorporating "The Columbia, Lancaster and Philadelphia Railroad Company." This charter also proved, like its predecessor, to be a dead letter. During the same session of the Legislature, some five other railroad companies were incorporated, but none of them were of any particular importance. Finally, in 1828, the Pennsylvania State Canal Commissioners were directed to locate and put under construction a railroad from Philadelphia (*via* Lancaster) to Columbia, and complete the same within two years if practicable. They were also required to examine a route for the Portage Railroad over the Allegheny mountains, which was subsequently built. Both lines were constructed by the State; they were completed in 1834.

Previously to this time, however, in March, 1827, the legislature of Maryland had granted the charter of the Baltimore and Ohio Railroad Company. This railroad was the first one built and opened in the United States that was authorized by charter to carry on a general business of transportation; the earlier roads (Leipers in Pennsylvania, and the Quincy Railroad in Massachusetts) having been built for private purposes. The charter of the Baltimore and Ohio Railroad Company was modeled on the old turnpike charters, as at this early date the question had not been decided whether stationary steam-engines or horse-power would be preferable as a means of traction. This was the beginning of the BALTIMORE AND OHIO RAILWAY, the first stone being laid by James Carroll, of Carrollton, one of the signers of the Declaration of Independence. Jonathan Knight was the chief-engineer of the road for the first four years of its existence, with Benjamin H. Latrobe and Henry J. Ranney as principal assistants. Mr. Latrobe subsequently succeeded Mr. Knight as chief, and under his direct supervision it was that the larger portion of the road was located and built, the many tunnels driven, and the heavy grades‡ overcome, that together stand a grand monument to the skill of this distinguished engineer, whose very name is identical with the rise of railroad engineering and tunneling in the United States.

The first division of the road was opened for transportation on the 24th

* Dr. Hollister's *History of the Lackawanna Valley*: also the *Railway World*, 2d Quarto vol. iii., No.15, p. 352, and *Ibid*, 10th Quarto vol., No. 1, p. 1.

† *History of the Pennsylvania Railroad* Wm B. Sipes, p. 5.

‡ See *The Railroad Gazette*, Quarto vol. vi., No. 471, New York, December 5, 1874 for an account of the location of the heavy grades on the Baltimore and Ohio Railroad.

of May, 1830, horses being altogether used for traction.§ There being, as yet, no settled mechanical mode of traction, Evan Thomas, during this year, constructed a car with sails, which he called the Æolus; on this car, Baron Krudener, the Russian envoy, made an excursion, resulting soon after in a visit from some Russian experts, who were sent out by the Emperor to examine the system. They engaged the services of Ross Winans for the construction of the Russian railways. Thomas' Æolus, however, was not used on the Baltimore and Ohio Railroad, except experimentally.

About the same time, Peter Cooper built, in Baltimore, the first American locomotive, and with it drew the directors of the road on a trial trip from Baltimore to Ellicott's Mills, at the rate of 18 miles an hour, and in August, 1830, steam-power came into regular use on the line. Cooper's engine was subsequently superseded by one built by Phineas Davis, at York, Pa., in 1831. From this time on, railroad construction advanced more rapidly. In the autumn of 1834, a locomotive built in Boston was taken, *via* the Pennsylvania Canal and Allegheny Portage Railroad, to Johnstown, and during the winter shipped thence to Pittsburg, where it was used as a pattern for the construction of two others; the three were put into regular use on the Portage Railroad duringthenext year. It is also said‖ that there were locomotives running on the "Mad River Railroad," out from Sandusky, Ohio, in 1833 or 1834.

After the Allegheny Portage Tunnel came the Black Rock Tunnel¶ (1835–'37), on the Philadelphia and Reading Railroad. Mr. William H. Wilson, who was resident engineer in charge, is now (1877) consulting engineer, Pennsylvania Railroad. This is noticeable as being the first tunnel in the country on which shafts were sunk. The width of the tunnel was 19 feet; diameter of shafts, 7 feet; they were sunk outside of the tunnel cross-section, so that the sides of the shafts should be tangent to the outer line of the tunnel. These shafts were six in number, located in pairs, 100 feet apart, for the purpose of correcting the errors in alignment that were expected to arise at each shaft, from having to turn a right angle, after bringing the line down.

It is worthy of note that this art of tuneling has gone in past ages hand in hand with the higher civilization of each era. As a people becomes more civilized, its civilization can be gauged by its progress in tunnel construction, and whatever be the particular motive, the result is always the same. Thus we have seen the religious fanaticism of the Egyptians and Hindus manifested in their grottos and rock-cut temples—the more practical bent of the Assyrians shown in their tunnels and archways. Later, with the Greeks, the religious idea becoming blended with the æsthetic, we find no longer tunnel-building associated exclusively with religion but the progress of the age is shown in the drainage tunnels of Lake Copäis, the Samos Tunnel, and others. Then with the grand public works of Rome, tunnel-building reached its culmination in ancient times. As civilization went down in darkness, from the decadence of the Roman Empire to the Renaissance, so we see all through the dark ages no evidence of tunnel construction on a large scale, except in the crypts and cloisters of those days. Finally, with modern civilization, we have tunneling in its last and greatest development, and we see that in proportion to the civilization of a people will be found their development in this art. This is most natural, for, of all branches of construction, it is one of the most difficult. A barbarous people may, perhaps, develop a high degree of perfection in the mere art of open-air building, where stone can be piled on stone, and rafter fitted to rafter, in the light of day; but it takes the energy, knowledge, experience and skill of an educated and trained class of men to cope with the unknown dangers of the dark depths that are to be invaded by the tunnel-man.

THE HISTORY OF EXPLOSIVE COMPOUNDS, DRILLING, AND BLASTING.

In order to at all clearly trace up the various steps in the history of explosive compounds, it will be necessary now to go back to their first introduction in the art of war.**

The invention of gunpowder is generally attributed to Berthold Schwartz, a monk in the order of St. Augustine; and the date as far as it can be fixed, seems to be about 1320, or one hundred and thirty years before the invention of the printing-press. As these early dates, therefore, have to be drawn from old manuscripts, the various accounts of the early introduction of gunpowder into Europe are very conflicting.

Now, although we are decidedly uncertain as to the exact time of Berthold's invention, and probably shall remain so, there is no doubt of the main fact that long, long before he applied or invented in Germany what we know as gunpowder, explosive mixtures of various kinds were known and used far back in the dark ages; and if we go to the East, we find gunpowder itself in use among the Chinese before the Christian era.

The oldest statement in manuscript, on the preparation of explosive compounds, is said to have been made (according to Meyer) by Julius Africanus, in the year 215. According to the same authority (Meyer). the Arabs, in 690, when besieging Mecca, hurled balls of fire, by the use of naphtha, upon the roof of the Caaba, and the soldiers of the Emperor Leo are also said to have used these balls of fire in 811.

In 668, the Greek Callinicus, of Heliopolis, is said to have communicated to Constantine IV. the ingredients of this mixture, termed by the ancients "naphtha," now known as "Greek fire." It is well known that it enabled the Byzantines to withstand the crescent for centuries; and Hoyer directly says that fire was hurled at the enemy, and that balls of earthenware, filled with this composition, were fired from tubes; that the mixture was by no means fluid, and that it most probably consisted of the ingredients of our powder mixed with resin and petroleum. Later historians and engineers do not go to such lengths, but are satisfied in assuming that Greek fire was probably hurled from a slinging machine of some kind. It should be noted that the older statements as to theuse of guns are frequently looked upon as arising from a misconception of the word "bombarda," and that the earlier guns were in fact balistæ from which were hurled fiery bodies.

The oldest authentic statement on gunpowder is attributed, according to Jebb,†† to Marcus Grachus; a manuscript bearing his name is said to exist at Oxford, which describes‡‡ a mixture of 1 lb. sulphur, 2 lb. charcoal, and 6 lb. saltpetre, as known in 846. Later, Meyer writes that, in 1073, King Salamo, of Hungary, used guns at Belgrade; and that in 1098 the Greeks are said to have had them in a naval encounter with the Pisans. According to Hoyer, Peter Mexica quotes from the history of Bishop Peter, of Leon, to the effect that, in a naval fight, the ships of the King of Tunis, at Toledo, about 1085, had certain guns, "bombardis," from which they shot "fiery thunder."

An old chronicle states that when Richard I., of England, was off Cyprus, in 1191, with his fleet, he fell in with and "conquered a mighty argosy," well stored with provisions, arms, and other munitions of war, among which were "abundant phials of Greek fire, and three hundred combustible serpents," or, as old Speed reads them, "fireworks and barrels or cages of venomous serpents." These "combustible serpents" were probably of the kind described by Joinville, and seem to have been a kind of rocket.

It is further said that the Tartars, in 1232, used guns against the Chinese; and (according to Hoyer), in 1247, Don Jayme threw large glowing balls when besieging Valencia. In 1247 Seville and, in 1249, Damietta were defended against Louis the Holy with fiery balls which were the terror of the Crusaders.

Roger Bacon (died 1284) speaks of the destructive effects of saltpetre compounds as then a well-known fact, saying that from saltpetre and other substances terrible thunder and lightning may be produced. §§

John Mathäus de Luna, in his work *De Rerum Inventoribus*, attributes the first invention of guns and muskets (bombardam, bombardulam et scolpum manualem) to the learned Monk, Albert Magnus (died 1280, at Cologne). According to the chronicle of Hieron. Peez, of Leoben, Sultan Melech Seraph, in 1290, used three hundred machines which incessantly threw Greek fire, while besieging Ptolemais.

(TO BE CONTINUED.)

NEW PATENTS.

The following is a list of new inventions relating to Iron, Coal, Mining Machinery, Chemical Apparatus and the Treating of Precious Metals, etc., from the official *U. S. Patent Gazette*, for week ending February 5, 1878:

No. of Patent.	*Title of Invention.*	*Name of Inventor.*	*Residence.*
199,900	Tubes for Wire Rope Railways	Wm. Eppelsheimer	San Francisco, Cal
199,901	Wire Rope for Railway Tubes	Wm. Eppelsheimer	"
199,912	Apparatus for the Manufacturing of Gas	E. J. Jersmanowski	New York, N. Y.
199,913	Lubricating Compounds	Clark Johnston	Rochester, N. Y.
199,928	Carbureting Apparatus	Michael D. Nelson*	New Richmond, O.
199,955	Screw Hoisting-Pulley Apparatus	Alfred Box	Philadelphia, Pa.
199,961	Steam Engines	James G. Cooper	Brooklyn, N. Y.
199,978	Steam Engines	Joseph Holub	New York, N. Y.
200,000	Carbureters	Mortimer Shea & Co.	Nashville, Tenn.
200,019	Blast and Reverberatory Furnaces	Cornelius Bennett	Clifton, Arizona.
200,024	Rock Drilling Machines (Hydraulic)	Alfred Brandt	Ebensee, Austria
200,026	Air Pumps	Warren S. Burgess	Norristown, Pa.
200,036	Rotary Engines	George Evans	Cleburne, Texas.

* Assignor (one-half right) to Samuel L. Yourtee.

UNDERGROUND TELEGRAPHY.—The Austrian *Military Review* gives some particulars as to the underground telegraph lines which are being laid from Berlin to the most distant extremities of the German Empire. The first underground line completed was that between Berlin and Halle, which is to be connected with three lines from Berlin to Cologne, from Berlin to Frankfort-on-the-Main, and from Berlin to Strasburg. The lines from Berlin to Hamburg and Kiel, from Berlin to Breslau, and from Berlin to Konigsburgh were then proceeded with. The Berlin-Hamburg line is provided with two parallel cables, each of seven wires, and from Hamburg one of these cables is continued to Kiel, and the other to Wilhelmshafen and Emden, where it is joined on to the North Sea Cable to England. The work of laying these cables is very difficult in moutainous districts, but along the high roads it is simple enough, and of late the operation has been further simplified by the use of a machine constructed for the purpose. This machine, attached to a traction engine, excavates the earth along the line of route, and, having laid the cable in the ground, throws it back again; the only manual labor required being that of the men who level the soil afterwards. This machine was tried in the presence of Herr Stephan, the Director of the Prussian Post Office, upon the underground line from Berlin to Spandau, by way of Charlottenburg, and was found to work very well. Marshal von Moltke has dispatched a detachment from one of the "railway regiments" to Spandau to make an underground passage for the cable underneath the fortifications, and a commission composed of civil engineers and telegraph employes has been appointed to arrange for laying down, in the course of the spring, the lines from Berlin to Cologne, Frankfort and Strasburg.

SPONTANEOUS MOVEMENT OF AIR BUBBLES IN LIQUIDS.—In a paper in the *Bulletin* of the Belgian Academy of Sciences (Nos. 9 and 10), Prof. Van der Mensbrugghe discusses the causes of the seemingly spontaneous movements of bubbles of air in levels and of vaporous bubbles in the microscopical cavities of minerals, these researches being part of those into the tension of surfaces of liquids. Prof. Mensbrugghe explains these movements, as Mr. Hartley also does, by changes of tension in the surfaces of liquids produced by changes of temperature; when the temperature of the liquid at one end of the bulb becomes, for some reason, higher or lower than at the other end, however small the difference, the tension of the surface decreases at the warmer end, and the bubble moves toward it. But, a thin film of water remaining on the glass, the surface of the liquid is enlarged at the warmer end, and diminished at the opposite end, and this, says *Nature*, according to experiments of the author, lowers the temperature and increases the tension at that end; so that if the temperature now ceases to rise, the motion of the bubble is not only stopped, but the bubble also returns backward. Thus each displacement of the bubble immediately gives rise to such forces as tend to produce a motion in an opposite direction; and the variations of tension produce the more obvious motions the smaller the massess of liquid in which the bubble is swimming. The same explanation may be applied also to the movements of bubbles in microscopical cavities of minerals filled with liquids. In that case, the bubble being produced by the vapors of the liquid, its movements are yet more rapid, as every change of temperature is followed by further evaporation of the liquid, or by condensation, both which alter the dimensions of the surfaces of the liquid and their tension. The author supposes also that the Brownian motions of powders suspended in liquids may be explained in the same way, and that those powders which absorb most gas will best display this kind of motion.

§ *History of the Baltimore and Ohio Railroad Company*, by "A citizen of Baltimore," 1853.

‖ W. Milnor Roberts, in the *Railroad Gazette*.

¶ The author is indebted to Mr. William H. Wilson, Consulting Engineer Pennsylvania Railroad, for data on this tunnel.

** Most of the early history of blasting in Germany, as given in the following chapter has been translated directly from Rziha's *Lehrbuch der Gesammpten Tunnelbaukunst*, I., p. 39. The English notes have been largely taken from Weale's *Quar. Papers on Engineering*, vol. v.

†† Roger Bacon, *Opus Majus D.* Sam. Jebb, London, 1733.

‡‡ Hoyer, p. 8.

§§ Roger Bacon, *Opus Majus*, p. 474. Hoyer, p. 37, and additions p. 1 in vol. i.

THE NEW WORKS AT CLAUSTHAL FOR DRESSING ORES.

By John C. F. Randolph, E. M.

[*Continued from page* 133.]

(WITH SUPPLEMENT—NO. III.)

THE BUILDINGS.

The Stone Breaker House (marked *h* on the general plan of the works, Plate No. 1, February 16). The arrangement and details of this building are shown in detail by Figs. 1, 2 and 3 of Plate No. 3, of which Fig. 1 represents the front elevation, Fig. 2 the plan, and Fig. 3 the transverse section. The mixed ore enters the second story by a track on the back side of the building at *a*. It is dumped from the car on the inclined grate *b*, and arrives on the horizontal grate *c*. These two grates are placed above a hopper, *d*, which receives the smalls falling through the grate. At the lower opening of the hopper is a feeding roll of ordinary construction (shown on right hand of Fig. 1) by which the material in the hopper is fed steadily into the washing and sorting drum *f*, to which water is supplied from the reservoir *a* by the pipe *k*. The ore remaining on the grate is pushed down the iron lined shute to the breaker *h*, from which it falls directly through an iron shute into the sorting drum *i*, in which it is sized dry. The stuff passing the drums is delivered into the bins *o o* which face toward the centre of the building. The stuff refused by the drums is delivered into the bins *n n* facing the opposite sides of the building. All the bins have inclined bottoms and discharge doors in front for discharging direct into cars. The inclined bottoms of the bins belonging to the washing drums are provided with screens in their upper part for draining off the water, which flows down an inclined partition into launders, *l l*, which lead it to the clearing tank *m*. The material below 32^{mm} is carried from the bins *o o*, by cars, along the track *p p*, to a slope, *l*, outside (general plan plate 1) to be lowered at once to further treatment, or goes to the ore ground to be stored till it is needed. The other size above 32^{mm} is discharged from the bins *n n* into cars by which it is carried on a trestle work to the upper part of the picking houses *i* and *k* below. The stuff from the bins *n*, beneath the breakers, goes to the the picking house *k*, and that from the bins *n*, beneath the wet screens to picking house *i*. The cleared water from the clearing tank *m* goes off by an iron pipe for further use below. At the end of the building are two hoists, *s s*, which are used principally for raising ores to the breakers which arrive from below. The breakers and drums are driven by a small Corliss engine, and the manner in which the shafting and belting is arranged is shown clearly by the drawing.

The Picking Houses (Fig. 20, and *i* and *k* on the general plan.)—The two picking houses are of similar construction, and Fig. 20 represents a vertical transverse section of them both. The building *k* is 50^{m} long, and the building *i* 35^{m} long. The ore enters on the upper story of these buildings by the tracks *a*, *b*, which bring it over the trestle work from the breaker-house. It is dumped from the cars into a large central wooden receptacle *c d f e*, which runs the length of each building. The bottom of this receptacle is formed of masonry, sloping from the centre toward the two sides, and serves to distribute the ore to the tables on either side through openings at *d* and *f* 300^{mm} high. Below the tables on either side of the receptacle are receiving boxes *i* with sloping bottoms, which discharge into cars below. In the larger building there are 34 of these receiving bins below each table, and in the small one 22, or a total of 68 in the building *k* and 44 in the building *i*. In *k* each table is divided into 12 divisions, and in *i* into 8 divisions. In the front edge of each divison is a series of shutes for the different classes into which the ore is picked, each of which communicates with a bin. The ore is drawn down from the hopper by a rake as it is wanted. Before each picker are sliding boxes, into which picked mineral is thrown, according to its class. After inspection by the foreman, the boxes are drawn forward over the shute belonging to that class of mineral, and the mineral goes to the bin. Along the sides of the building are tables to which picked ore needing cobbing is taken. The "deads" from the picking houses are carried off by cars and dumped into the neighboring Zellerfeld valley, as shown in the general plan of the works. The different classes of pickings are either stored on the ore ground for sale or for further concentration, or are lowered at once by the incline *m* to further treatment.

The Coarse Separation House (Figs. 4, 5, 6, Plate 3, and marked (1) on the general plan of works.)—The ore enters this building on the upper story by the track *g h*. It is dumped from the cars into the hoppers *i i i i*, from each of which it is fed to a set of drums below by a feeding roll of usual construction, *K*. The two larger sizes from the drums (viz., above 32^{mm} and between 32—17.78^{mm}) are delivered into bins *l l* (Figs. 4 and 6) at the back of the drums. The other five sizes from the drums are delivered into bins *t* on the front. Beneath the lowest drum of each set is placed a zinc funnel, *m*, for catching all the stuff below 5^{mm}, which is from time to time drawn off by the launders *n n* to the adjoining fine separation house. The turbid water overflowing from the zinc funnel goes by the pipes *o o* to the sets of spitzkasten outside (*p p*), from which the overflow goes by the trough *q* to the settling tank *r* in the floor of the building, and the pipe *s* to the buildings below. The turbine *a* gives the power to the building, which is transmitted by shafts, counter-shafts and belting, as shown.

(TO BE CONTINUED.)

COST OF ST. GOTHARD TUNNEL.—The cost of carrying out the original plan of the new line which is to connect the railways of Germany with those of Italy by way of St. Gothard would, according to a paper just issued from the German Chancellory, amount to 289 million francs, being 102 million francs in excess of the original estimate. The original scheme, which included several branch lines, has accordingly been cut down to such an extent that the first estimate will only be exceeded by 40 million francs. Of this sum the Governments of Germany, Italy and Switzerland have agreed to provide 28 millions—Germany and Italy each subscribing 10 millions, and Switzerland 8 millions—on condition that the St. Gothard Railway Company provides the remainder, or 12 million francs. The subvention which the three governments had agreed to give on the original estimates was altogether 85 million francs, and will, therefore, be increased to 113 million francs, while the capital the company will have to raise will be 114 million francs. These final estimates now only await the approval of the German Federal Council, which, says *Herepath*, it is confidently expected they will shortly receive.

THE SAN JUAN (COLO.) SILVER MINES.

By W. Weston, Ouray, Colo.

It may seem somewhat preposterous for a man who has been but six months in the mines, and who is now snowed-up in a basin 10,800 ft. above tide-water, to write of such an extensive and wonderfully-rich country as the San Juan, but the very fact of being in here for the winter enables me to speak with confidence on a subject very intimately connected with the welfare of the region generally.

I date its mining history from September, 1873, when the Utes ceded the land to the Government, and during the subsequent four years great strides have been made toward development, but though shockingly deficient in roads and reduction works, I cannot but see that, with the facilities we have, there is a surprising absence of influx of capital when such apparently fabulous remuneration is offered by the mines for its outlay. What are the reasons of this? Having studied the matter much of late, I have come to the conclusion that there are several, and, perhaps, you may deem the question of sufficient importance to give it consideration in your columns.

In the first place, I cannot but think that Eastern and Western capitalists look on the stories of our mineral riches very much as the Chinaman, who, being dealt four kings at poker, threw down his hand, remarking: "Shucks! too goodee!" Of course we all know that the American nation beats the world at advertising, and the records of "big strikes" and rich assays in papers published in mining camps and copied into Eastern newspapers, should be taken *cum grano salis;* but surely they are of sufficient reliability to cause men of capital to come and see, which they do not to the extent one would expect. In writing to a friend in England, a mine owner of large experience, concerning a mining property here which it was proposed to sell for $250,000, he answered as follows, referring to my description of the property: "No one in Great Britain who has five pounds to invest can be made to believe that the man lives on the other side (in the United States) who would sell such a property for $250,000, *or at all!*" But there are such men in the country; and that very property was sold this fall for $30,000.

Referring to my first paragraph, there seems to be a general impression that our mines cannot be worked in the winter, and a very natural conclusion it is for outsiders to come to when they see that mine owners and mill men "go out" to hibernate elsewhere; and this fact, it seems to me, is doing more to retard the proper development of the country than aught else. People naturally say: "If your mines are so rich, and your reduction works pay such enormous profits, why don't you stay in and work them?"

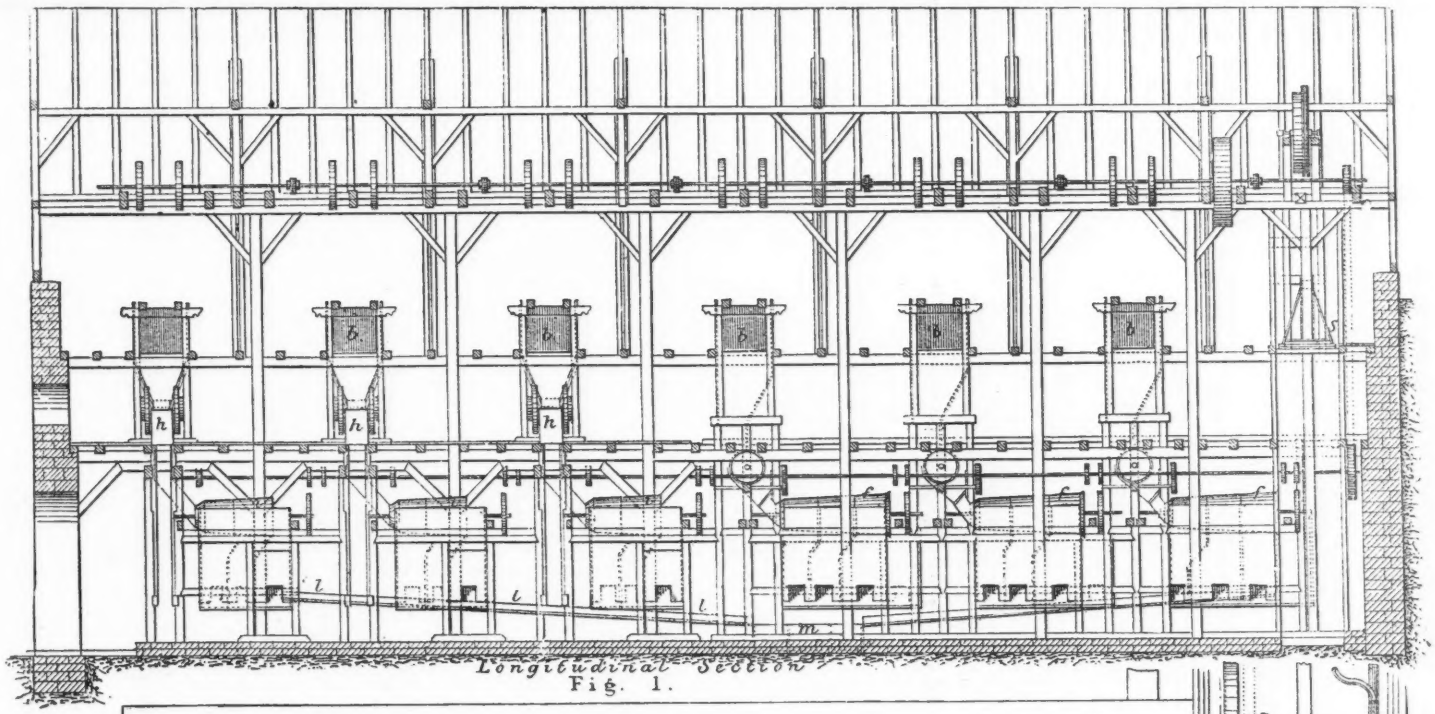
In Silverton a smelt mill, in Lake City two smelt mills and lixiviation works—all shut down and the owners "gone out." What is the reason of this? I have yet to see the mine in this country which, with capital, cannot be worked all the year round on account of its altitude. My partner and I are working at an altitude of 10,800 feet only, and in the timber, but we had to do so, as our only capital is muscle, "grub," powder and fuse; but I have visited most of the best mines, and have yet to see the one above timber line where I could not make myself equally comfortable and work with equal facilities, if I had capital to expend in preparations therefor, with plenty of fuel, grub, tools and a comfortable cabin. What more does a man want if he means business?

Then what is the reason of this yearly exodus? The miners say they "go out" because there are no mills running in the winter to buy their ore; the mill owners say they "go out" because they can't get ore in the winter to run on. Here, then, is the dead-lock. The miner expects the mill man to come and look at his "prospect hole" and erect a smelter on the prospective output, and the smelter wants to see the ore on the dump before he will build. Please tell us the remedy for this evil. The miners of San Juan are, as a class, poor men, and cannot afford to produce ore unless they see a prospect of immediate returns. For my part, I cannot see why a smelt mill should shut down for want of ore, when large and rich lodes are going begging all over this region for a few hundred dollars, one of which lodes would supply a mill of large capacity with ore the year round.

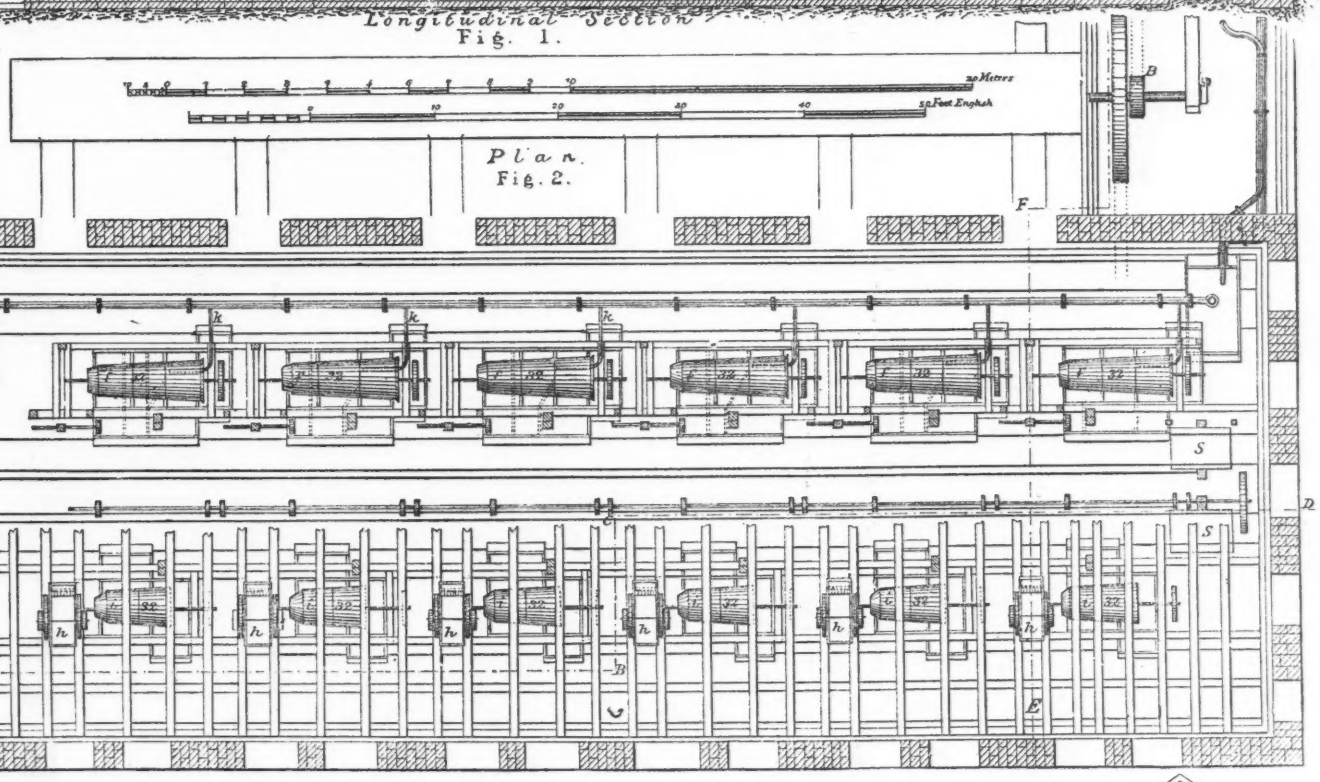
Last year I noticed another reason. Capitalists from the East, who had been reading all winter of our mines, came here early, so as to be *the first*—came in April and May, and when they arrived found snow on the mountains and the ranges impassable. Of course they could see nothing and went back disgusted, saying the country was "too new." No man should come here till the middle of June, at the soonest, and better in July, August and September. July being the usual rainy season, I should prefer August and September as the sure months, when a visitor can enjoy the lovely scenery and beautiful surroundings without let or hindrance in the way of vicissitudes of climate.

A most striking proof of the need of smelt mills is the simple fact that here in my district "hundred-ounce ore" is rated "low grade," and will not pay to produce at this writing. Supposing I have a mine yielding such ore. It costs $20 per ton to pack to Silverton (20 miles), $15 per ton for cost of producing, and the smelter there gives me $42 per ton for it, leaving a margin of $7 per ton only.

We own a claim here, the lode showing a five-foot crevice, one foot of solid galena running about 40 oz. silver to the ton; the drift on the vein, and in the middle of splendid pine timber and close to a large stream and a good trail to the mouth of the tunnel. If we wanted to sell it—which we do not—I don't suppose we could get $500 for it. What would such a mine be worth in the Georgetown District? In Nevada they would have a hundred men working on it and it would be worth a million. There are a hundred such lodes within a five-mile radius of this cabin, which are as yet worthless, owing to want of reduction works and that alone. The most extraordinary part of it is that the mill facilities in the very heart of the mines are unequaled; water power and timber of the best, and a wagon road from the end of the Denver & Rio Grande Railway to Ouray, from there to the heart of the Sneffel's District is about six miles; a good trail now and two charters out for a toll-road, which, I believe, could be built for $5,000, to the confluence of Imogene and Virginius creeks. In the Imogene and Virginius basins there are, I believe, thirteen mines being worked this winter, but four or five of them are prospective tunnels only. The average produce of the ore from the others will be about 175 oz. to the



Longitudinal Section
Fig. 1.



Plan.
Fig. 2.

REGISTER.

Figs. 1, 2, 3—The Stone Breaker House.

" 4, 5, 6—The Coarse Separation House.

" 20—Picking House.

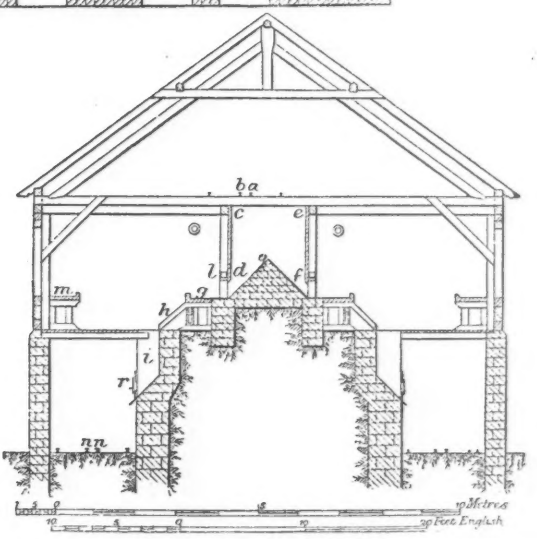
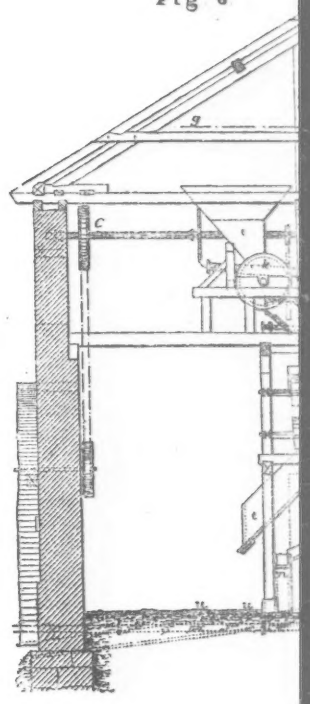
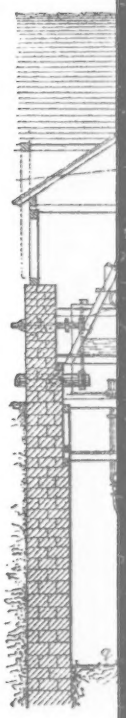


Fig. 20.

Fig 6





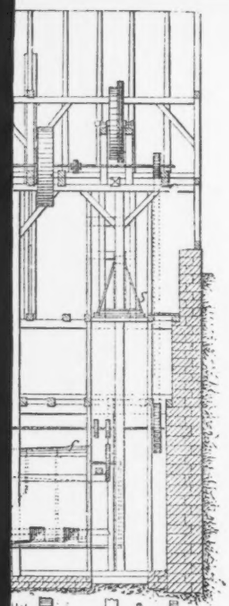
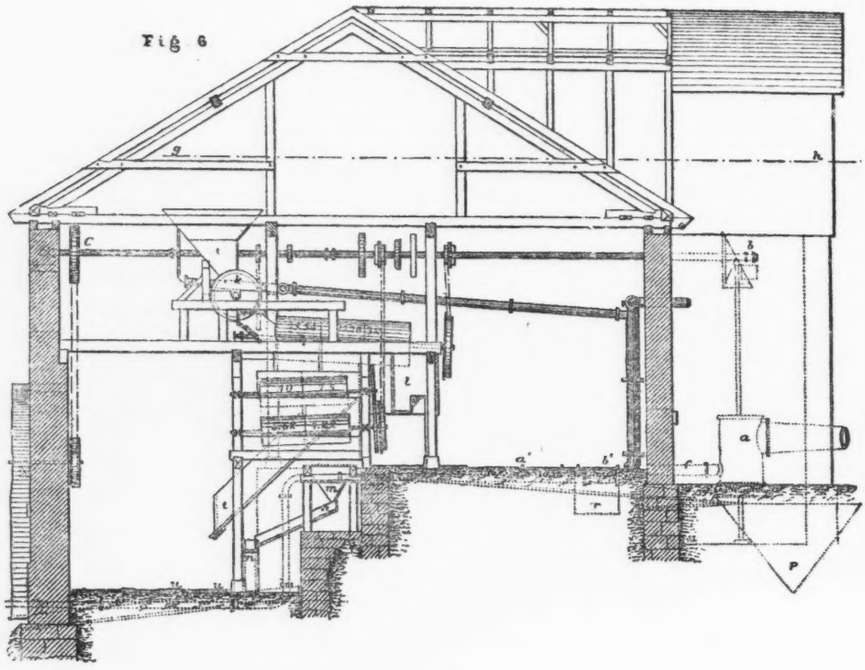
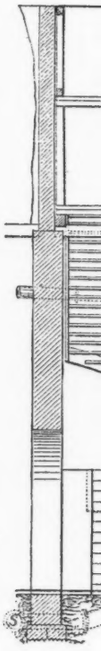
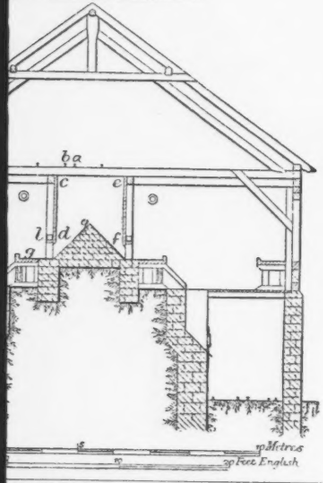


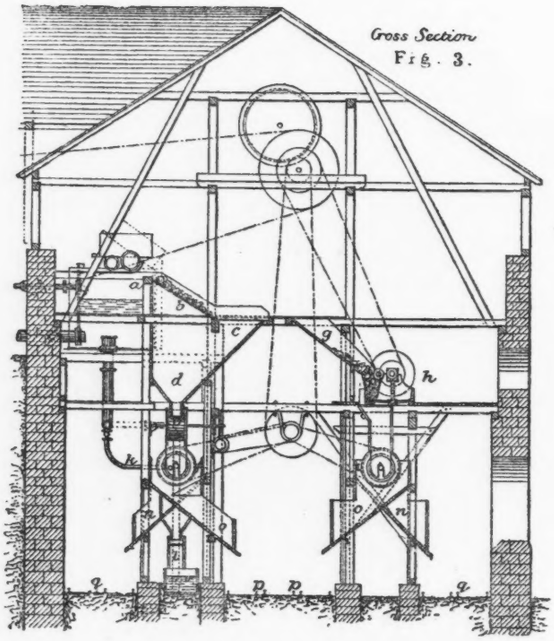
Fig 6







Cross Section
Fig. 3.



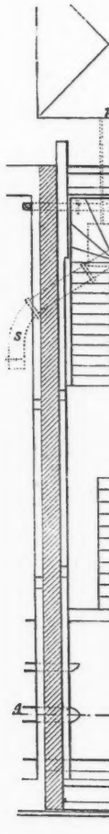


Fig. 4.

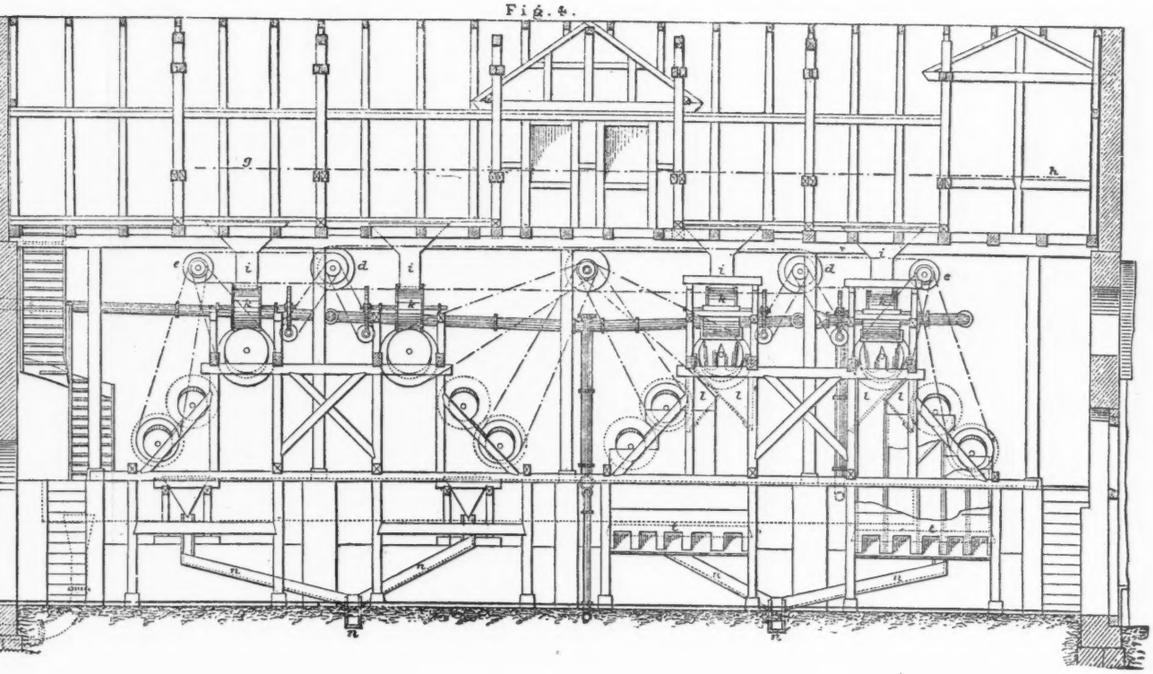
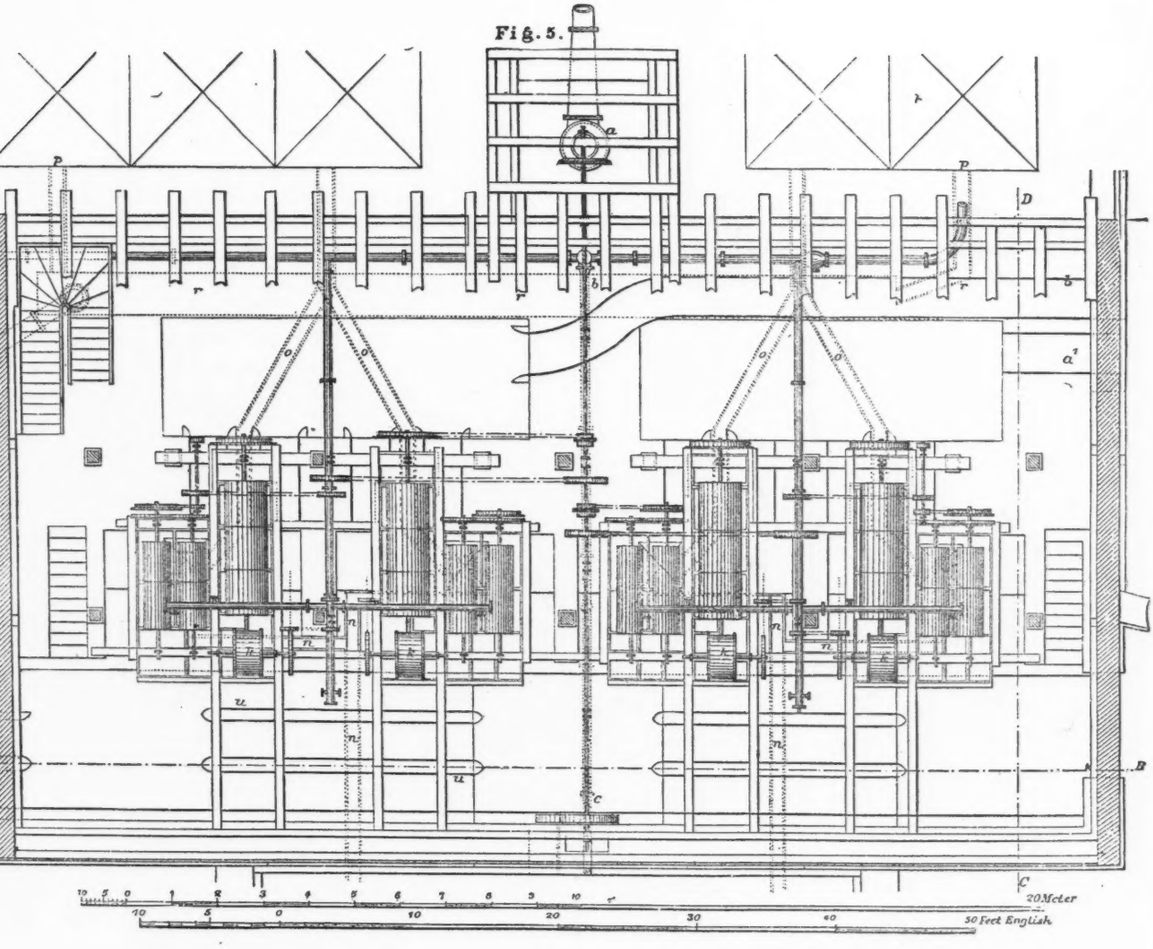


Fig. 5.



ton, and most of it will be sent to Lake City (37 miles by trail and 110 by road) for reduction.

Yet another reason for the absence of capital is our remoteness from the great seats of wealth of the United States—the cities of the Atlantic and Pacific seaboard. Either from San Francisco or New York, San Juan is looked on as out of reach, and a tremendous journey, whereas it is really not so. From either city you can travel to within 60 miles of Del Norte by rail, and from there you can go by Barlow & Sanderson's comfortable coaches, or by your own vehicle or saddle animal, which you can hire or buy, into the mining districts proper, say a hundred miles further west.

A miner from Georgetown, of long experience, came on here this summer, and after seeing the mines and country pretty thoroughly, said: "The time is not far distant—two or three years at the most—when a lode with a continuous foot of solid mineral milling 50 ounces to the ton will be worth an immense fortune." Of course we know that in time this region will come to the fore as a great producing place, but if by stating a few simple facts through the medium of your columns we can hasten that time, surely it were well to do so.

This is no place now for the man without *some* money. The plucky but shiftless prospector who came in and endured hardships of all kinds to find a good claim—which, when found, he went out with the sample rock in his pocket and sold—has had his day. Prospect holes are no longer in demand, and no man with sense will now look at aught but a developed mine, and there are hundreds of these going begging for trifling sums, for various reasons, among which are the following: A multiplicity of owners, and consequent dissensions; owners too lazy to work; inability to procure "grub" and tools for a start; owners tired of "hanging on" to their property and wanting to go "back East" to their friends. Moreover, the country, in this district at least, is not half prospected; many good lodes are constantly being discovered, and will for the next year or two to come, but a good prospect is of no value to the owner or discoverer unless he means to work it.

Regarding exaggerated reports in our mining sheets, a great deal of it occurs in this way: A man discovers a good lode, or "strikes it rich" in one he is working—say Galena carrying gray copper (which latter in this district is invariably highly argentiferous). Instead of taking out a sample from his pay streak as he would sort it for the mill, he picks out the richest lot containing the most gray copper, rushes down to the assay office and gets a return of say 800 ounces; the newspaper gets hold of it, and a paragraph appears to the effect that "John Smith has 'struck it rich,' and has had an assay of 800 ounces from his ore." This is copied into, say the *Rocky Mountain News*, and from it into the Eastern newspapers. The miner had no intention of fraud, but deceived himself, and before long really believed that he had a lode which would "run 800 ounces." When I first arrived here I was struck by the absurdly small values placed on unquestionably rich mining property, that I immediately gave my attention to placing the facts before some gentlemen of large influence in London mining circles, but, as I soon found, utterly without avail as regards making a sale. One of them cleverly sums it up thus in a letter to me: "I do not see my way at all to help you at present in the manner you present these things, which is the old stereotypeed but used-up system—enterprising, plucky men prospect, find a lode, spend a few months on the place, open it out, perhaps work it a year or two and then, while showing that $200,000 per annum can be made out of it, offers to sell at $100,000. Well, the first thing that occurs to people is—£20,000 wanted, gone—for what? The privilege of embarking a lot more money in an extremely out-of-way place, where, or in similar localities, hitherto all such investments have had one result." After finishing my course in the Royal School of Mines of England last winter, before leaving for this country I called on some mining firms in London to whom I had introductions. They immediately confronted me with the "Emma Mine swindle" and others in Georgetown where English capital had been lost, of course attributing the loss to American "sharpness" instead of as is really the case to British mismanagement. The first thing they do is to pay about ten times as much for the mine as they could get it for if they went about the purchase properly; then they send out a manager whose best qualification for the post is that he is a needy friend or relative of the President or a Director of the company; then they go to work and build extensive works, buildings, tramways, etc., and, what with mismanagement and premature and unnecessary outlay, they put more silver *into* the mine than they ever get out of it, reminding me of the old Yorkshireman who said that when he and his wife commenced business they eat porridge and after a while chicken, but when his son commenced business he wanted to commence with the chicken and consequently failed.

Regarding the winter up here I can only say that I have so far enjoyed it. The lowest the mercury has been was to 16° below zero 7 a. m. and about Christmas for a week it ranged between 10° and 2° below, but the air is so crisp and light that one doesn't feel the cold, especially when at work; indeed, I have felt the cold more in Brighton, on the coast of England, with the thermometer at freezing point, only than I have here. I keep a daily record of the temperature and my aneroid thermometer keeps me posted as to the approach of a snow storm, and this I have found to be a most invaluable instrument both as a weather indicator and for determining altitudes.

What a man needs is plenty of plain, wholesome food, temperate habits, warm clothing and bedding and a well-mudded cabin and he will find a winter in the mines at this or a greater altitude a most healthful existence. Writing to a Denver paper it were a work of supererogation to say anything concerning the beauties of the mountains and scenery; it is too well known. Our lakes and streams swarm with trout and our hills in summer abound with deer and other large game, and having been all round the world I can say that for a man of energy and muscle and a little capital, and who wants sport, gorgeous scenery and a chance to make a fortune rapidly, I have never seen the equal of San Juan.

A BRIDGE ACROSS THE NILE AT MANSURA, designed by Alfredo Cottan, of Naples (who has built over 1,000 metallic bridges in Italy and the East), is partly of stone and partly of iron—"a combination of the suspension principle, with straight girders,"—at least so says the *Scientific American* of March 2, although where the suspension principle comes in on the six-pier lattice bridge, shown in our contemporary, we do not clearly see.

MINING NEWS.

COLORADO.

Mr. F. Fossett, of Central Colorado, sends us the following summary:

Since the remonetization of silver is likely to cause an increase in coinage facilities and in the number of United States branch mints, the question of securing the most advantageous locations for such institutions is worthy of consideration. There is no mint of coinage in the entire Rocky Mountain mineral-bearing region, and this produces ten times the amount of gold and silver mined in the East and South, and will soon rival the Sierra Nevada and Pacific Slope regions in its annual output of the precious metals. No other point possesses the manifest advantages of location, railway communication and mutual accommodation to both the mining sections and the Government, as the City of Denver, in Colorado. It is the most centrally located of any important point in the Rocky Mountain region, and possesses a railway system that is rapidly extending into the various mining districts of Colorado, southward into New Mexico and north to the Black Hills and Montana. The country that would be tributary to a branch mint at Denver produced the following amount of gold and silver in 1877, lead and copper being excluded from these figures.

Colorado	$7,346,975	Montana	$2,644,912
Utah	6,375,055	New Mexico	838,000
Black Hills	1,500,000	Wyoming	200,000
Total			$18,904,942

This same section will, without doubt, produce over $24,000,000 in 1878, and $30,000,000 in 1879. There are no coinage facilities of any importance nearer to it than Philadelphia on the Atlantic seaboard, and San Francisco on the Pacific—the Carson institution in western Nevada doing but little in this line. This section is but a little more than half way on the route from the Atlantic to the Pacific, and if any additions are to be made in governmental coinage facilities this section would seem to be the one needing them.

A RICH DISCOVERY ON THE BOBTAIL.—A remarkably rich ore body of large size has been discovered in that portion of the Bobtail lode (near Central) that lies east of and adjoins the property of the Consolidated Bobtail Company. This territory, 460 feet in length and owned by Sullivan & Co., was never developed to any great extent until recently, owing to its barren character near the surface. It was only by sinking a shaft for a long distance through "cap rock" that the vein was finally developed. The 500 and 600 ft. levels have entered an ore body twice as rich as that in the profitable Bobtail Company's ground. This is from three to six feet in width, yielding from $15 to $25 per ton after a very large quantity of the richer mineral has been selected therefrom. The latter is sold to the smelter at various figures between $64 and $170 per ton, being most valuable in the ground most recently opened. There is every reason to believe that this large, rich vein extends as many hundred feet in depth as it has been found to extend in length. The owners were induced to sink their shaft from the continuous ore bodies developed in the drifts run from the tunnel and main shaft of the Bobtail Company. In three months, from the time Sullivan & Co. entered this vein to January 1, the receipts were $12,237.75, of which $8,419.98 came from stamp mill ore and $3,817.77 from smelting ore. Assays of the latter gave from 3 to 8 ounces of gold, 12 to 18 of silver and from 3 to 8 per cent. of copper. The results of thirteen men's labor in January, in simply driving two levels, were as follows. The mine is not yet developed so as to produce largely; the figures are given to show the unusual per cent. of profit:

Mill ore, 44 cords		$4,458.28
Receipts from 14¼ tons of smelting ore		2,140.00
Total		$6,598.28
Mining and hoisting	$900	
Milling and hauling	1,100	
		$2,000.00
Net profit		$4,598.28

This remarkable profit of 70 per cent. of the gross receipts was obtained simply in drifting, while the ore bodies between the levels were left standing in the mine, to be "stoped" down in the future. In this work of development, a mine is considered a good one that will pay expenses, the profits coming mainly from stoping in the reserve ore bodies. January shows a return of over $500 for each man's labor, and February promises still better. When the mine is opened up, so as to employ 70 or 80 men, instead of 13, the yield will exceed that of the Bobtail Company, and the profits will be many times as large. The Bobtail Lode produced between $300,000 and $400,000 in 1877.

COLORADO MILLS AND WORKS.

The gold mines of Gilpin County keep 20 quartz mills with 605 stamps at work, the largest number ever steadily employed there at this season of the year. About 450 tons of ore are crushed daily, giving an average return of about $9.10 per ton. The richer ores in small quantities have previously been selected from this mill ore and sold to the smelter.

The Boston and Colorado Smelting Works at Black Hawk treat from 50 to 60 tons of ore daily, two-thirds of which come from the mines of Gilpin County. The company owning these works are preparing to establish the main institution at Denver, leaving only sampling works at Black Hawk. A railroad is also likely to be built by the same company from Denver to Black Hawk, Georgetown and other mountain mining towns.

The Trenton Company's new leaching works at Golden were recently started. The Malachite copper works are also in operation.

Two reducing mills are treating silver ores at Georgetown—the Pelican and Clear Creek Company. The latter company's (dry) concentrating works are running steadily. The Silver Plume and Silver Queen ore dressing mill are also at work.

The Hukill mine at Spanish Bar is shipping considerable ore from the mine, besides a quantity of dressed mineral, which is handled at the Miles' mill. This mill concentrates from 15 to 20 tons of Hukill ore into 5 or 6, making a salable article assaying from $100 to $140 per ton. Thirty men are employed in the mine. The Freeland mine, in Trail Run, is being developed extensively and proves to be one of the most valuable in Colorado

The Consolidated Bobtail Company employs in its property 200 miners and 95 stamps, and turns out about 70 tons of ore daily, that yields not far from $900 a day, or $27,000 a month. The Alps-Mackie mine, owned by the Cleveland Company, is producing ore worth $48 per cord from depths of between 300 and 400 feet.

Caribou District in Boulder County yielded about $200,000 worth of silver in 1877, and will do still better during the present year. About one-half of the product came from the Caribou mine. The mill attached to this property is located at Nederland, four miles from the mine. For several months five Vanner concentrating machines have been used there in dressing Caribou silver ores, with good results. This silver mill has been started up with leaching in place of pan amalgamation. There are four Bruckner cylinders.

About a month ago D. W. Brunton completed and started up the silver reducing mill of the Washington Avenue Mine Company, six miles north of Nederland or Caribou. The large ore supplies of this mine furnish the mill with ten or twelve tons of rather low-grade ore daily, and good work is the result. Mr. Brunton has built several mills of this description, and is a thorough mill man. The establishment has stamps, four Brunton cylinders for roasting (much like the Bruckners) and vats and tubs for copper leaching. Thirteen men are employed, including both night and day shifts.

MICHIGAN.

THE COPPER MINES OF LAKE SUPERIOR.—We take from recent issues of different papers published in the immediate vicinity of the mines the following information, showing the present condition of the copper mines of the Lake Superior region:

"THE SENACA MINE is working 18 men. A recent trial of 208 tons of this ore, stamped at the Pewabic mill, yielded about 2½ per cent. of mineral. At a late meeting of this company it was decided to sell this property and organize a new company, for the purpose of working on a more extensive scale.

"OSCEOLA.—The report of this company, not yet published, will probably show an addition of $100,000 to the surplus, and an expenditure of $40,000 for construction, during 1877. The company now has $140,000 surplus, and there is little doubt that a dividend of $2 per share will be declared in July or August.

"MERRIMAC.—Work is being prosecuted in the shaft on the Knowlton vein at this mine. The vein, though not yielding any very heavy copper at present, is producing some very rich stamp rock, the peculiar characteristic of the vein. The superintendent is confident that as the vein makes in the low land toward the Ogima, heavy copper will be found. Two tributors are also at work in a pit on the old Ridge vein near the line of the property, and finding considerable copper.

"NATIONAL.—The falling off in the product of this mine was the result of the almost total cessation of the work by the company, and the small number of tributors at work. It was hoped that 1877 would have seen a revival of the copper interests, so that the company would have been warranted in calling on the stockholders for a liberal assessment to open up the old mine again, which is believed by many to be rich in copper producing ground.

"THE SMALL MINES, such as the Superior, Hilton, Knowlton, Lake Superior, Evergreen

Bluff and Victoria, are from the labor of tributors, poor men who have their homes near the mines, and who, with their agricultural pursuits and tributing, make a living, and in some cases make money. Indeed, this may be said to be the only system in vogue here, as the Ridge and Mass are the only mines employing men by the month.

"THE CLIFF MINE is working a force of 50 men. It is sending to Eagle River, for shipment in the Spring, considerable copper, most of which has been gotten out on tribute. Some 35 tons being already down, and as much, if not more, at the mine.

"THE DELAWARE MINE employs 56 men, principally on surface improvements.

"ALLOUEZ.—This mine is being worked on tribute. The south end of it is affording some excellent rock. About 75 tons were taken from the mine last month, and that, too, in the face of the fact that the stamp mill was not working up to its full capacity. The present management is making alterations at the stamp mill, whereby it claims to be able to stamp the same amount of rock with less fuel than they have been using.

"CALEDONIA.—Captain Eathorn and party, tributors in this mine, are uncovering what promises to be quite a mass of copper.

"PEWABIC.—The pumping-engine house of this mine, which was burned during the past summer, has been replaced by a more sightly structure.

"MADISON.—A rich strike has recently been made in this mine on the 20-fathom level. This company employs a force of 30 men.

"ADVENTURE.—Only a few men have been employed at this mine, but in productive ground. The mine, from its very earliest history, has always been one of the best producing mines on the lake, but fate seems to decree that her capacity must be kept limited to a few tons per year.

"FLINT STEEL.—This mine is leased by Capt. S. Martin and worked by tributors. The product for the year was very light, the low price of copper not warranting the employment of more men, as we have no doubt the more copper there was taken out the worse the lessee would be off when the ingot got into market.

"QUINCY.—This mine employs about 500 men at present, and everything around the mine looks well and in place. No. 2 hoisting engine has stopped to put in a new cylinder, and do whatever repairing is necessary to the engine. There will not be any delay at the stamp mill, as there is plenty of rock on hand to draw from. The mineral percentage per ton of rock of this mine was less in 1877 than in any previous year of its history, but despite that fact, and the exceedingly low price of copper during the year, she paid her usual February dividend of $5 per share, and, what should be equally satisfactory to stockholders, opened ground enough to give a good long look—two years at least—ahead. The annual meeting of the stockholders takes place on the 6th of March. As the charter of the company will expire on the 30th of the month, it is necessary that some action should be taken to reorganize under the existing mining laws of the State. It is proposed to reorganize under the laws of Michigan, with 40,000 shares in place of 20,000."

We will refer to other mines in our next issue.

PRODUCTION OF LAKE SUPERIOR COPPER MINES FOR 1877.—We tabulate the product of all the mines operated in the Lake Superior District, as under:

Houghton and Keweenaw Counties.

Name of Company.	—PRODUCT— Tons.	Lb.	Name of Company.	—PRODUCT— Tons.	Lb.
Calumet & Hecla	14,172	530	Phœnix	671	385
Osceola	1,807	1,170	Pewabic	419	102
Quincy	1,652	580	Cliff	100	.....
Atlantic	1,440	.....	Clark	24	1,549
Central	1,408	.....	Houghton Tribute Co	23	1,281
Franklin	1,436	162	Delaware	20	1,728
Allouez	746	1,225	Isle Royale Tribute Co	7	969
Allouez Tribute Co. (Nov. and Dec.)	106	222	Mesnard	4	280

Ontonagon County.

Ridge	200	885	International	6	1,368
Mass	92	202	Superior	4	1,248
Minnesota	95	200	Knowlton	4	532
National	51	1,329	Hilton	2	628
Adventure	39	980	Lake Superior	1	785
Rockland	31	226	Evergreen Bluff	..	1,496
Aztec	19	123	Victoria	..	1,275
Flint Steel	16	375			

The January products for 1878 were as follows:

Calumet & Hecla	1,238	1,075	Franklin	129	325
Osceola	149	....	Pewabic	34	....
Quincy	130	290	Allouez, tribute	80	305

Dividends paid during 1877 were as follows:

Calumet & Hecla	$1,600,000	Central	$100,000
Quincy	100,000	Atlantic	20,000

NOTES.

PEAT-CUTTING MACHINES are wanted by a correspondent.

The usual supply of car coupling patents is furnished weekly at Washington.

TO REMOVE IRON RUST FROM GLASS OR CHINA, use ordinary commercial nitric acid.

THE COST OF DEPOSITING COPPER ON IRON by the electric process may be rated at about 75 cents a pound.

U. S. PATENT NO. 200,000 was recently issued. There were 11,348 issued prior to this series of numbering, which commenced in 1836.

NEW YORK GAS LEGISLATION.—A bill has been introduced into the New York Assembly amending the Gas Light Company Incorporation Act.

A COLLAPSIBLE CORE BARREL for casting gas or water pipes has just been patented by a Canadian, and is claimed to effect a saving of loam.

HEAVY COAL FAILURE IN CORK, IRELAND.—Messrs. Sutton & Co., coal and shipping merchants, at Cork, failed on the 26th ult., with liabilities amounting to $400,000.

THE ALLEGHENY CITY (PA.) GAS WORKS.—The people of Allegheny City, Pa., have decided against the purchase of the gas works by the city, by a vote of 3,571 to 500.

VENTILATING PENNSYLVANIA COAL MINES.—A bill was introduced into the State Senate of Pennsylvania on February 21, compelling the ventilating of *all* coal mines in the State.

A NEW PROCESS FOR WATERPROOFING AND SO TREATING PAPER BOARDS as to make panels as a substitute for wood, consists in impregnating the paper with oil, having a small quantity of drier, and afterward compressing and drying the boards.

ROLLING MILLS CONSOLIDATION.—The Chicago *Inter-Ocean* says: "Arrangements are being made for the merging of the North Chicago Rolling Mills Company, and the Bayview Rolling Mills, of Milwaukee, into one corporation, the capital stock to be $4,000,000."

"EMERY WHEELS" have the following substances used as cements or bonds for the abrading material: (1) "Hard Rubber" or vulcanite, (2) charcoal and glue, (3) shellac, linseed oil and litharge, (4) glue, linseed oil and litharge, (5) silicate of soda (water-glass) and chloride of calcium, (6) "celluloid," (7) oxychloride of magnesia, (8) infusoria, (9) glue.

AN EFFECTIVE METHOD FOR MAINTAINING THE PURITY OF ILLUMINATING GAS.—An interesting law case lately came before a London magistrate, namely: The violation by a gas company of the act of parliament which fixes the maximum of impurity permissible in illuminating gas. The company defendant was sued to recover eight penalties of £50 each for having on eight days supplied gas of less purity than the act allows. The court ordered a warrant to issue for the full amount of penalties claimed.

ACCIDENTS IN THE COAL REGIONS.—The head house and machinery at No. 2 slope, of the Susquehanna Coal Company, at Nanticoke, Pa., was burned on the morning of February 27. The loss is $12,000, probably uninsured. The men at work in the slope all escaped through a new outlet which was made last week.

POTTSVILLE, Pa., February 28.—An explosion of gas this morning in the Preston mines, at Girardville, instantly killed William M. Williams, the inside "boss," and seriously injured John Mahony, a miner.

FOREIGN MARKETS FOR AMERICAN PRODUCE.—*Portugal* would take bleached and unbleached cotton cloth for printing; also agricultural machines, mill machinery and sewing machines. *The Netherlands* could be made good customers in our special productions, petroleum, tobacco, cotton, Indian corn, rosin, turpentine and stores. In *Scotland* could be sold American machine-made wooden ware; also fresh meats. At *Bremen* shipments of agricultural machinery and tools and woolen and cotton goods could be sold. In *Switzerland* our canned goods take well. *Honduras* would take large quantities of cotton cloth, if put up in pieces of 18, 24 and 36 yards, and folded in even yards to suit retailers' convenience.

ANOTHER BURIED CITY.—Another buried city has been accidentally discovered in the neighborhood of Mount Gargano, near Manfredonia. There were found an ancient temple of Diana, a magnificent portico about 20 meters long, with an underground necropolis of great extent. A large number of important inscriptions has been forwarded to, and exhibited by, the National Museum of Naples. The discovered city is the ancient Sipuntum, near Arpinum, mentioned by Strabo and Titus Livius. The houses are nearly 20 ft. beneath the cultivated soil. This town was engulfed in consequence of a terrible earthquake. The Italian Government has ordered researches to be made on a large scale.

TELEGRAPH STATISTICS, 1877.—The latest figures give:

	Miles of line.	Offices.	Miles of line to sq. miles area.		Miles of line.	Offices.	Miles of line to sq. miles area.
England	75,000	5,600	1½	United States	79,000	6,850	36
France	28,800	2,370	7	British India	15,700	225	60
Italy	12,600	1,400	9	Turkey	17.600	400	105
Austria	28,000	2,900	9	Russia	31.500	900	330
Germany	19,100	3,300	11				

The Russian Archine is 28".

THE OLD TELEGRAPH SILVER MINE.—A dispatch from Salt Lake City says that the case of O. D. Ford, of Cleveland, against L. E. Holden, manager of the old Telegraph Mine, was concluded on February 21. A decision was rendered by Judge Shaeffer, refusing to appoint a receiver. One million dollars' worth of ore was shipped from this mine during the past two years, it supplying one-eighth of the entire lead production of the United States. It was claimed that Holden withheld from the stockholders information as to its value, and purchased their stock at a low price, paying therefor from the company's money. The stock was mostly held at Kalamazoo and Cleveland. It was claimed by the defense that all was paid for the mine that it appeared worth, but the mine afterward developed great wealth. The case has occupied five weeks, and was well contested by the best lawyers at home and from abroad.

A SANITARY PROTECTION ASSOCIATION.—Public intimation was given by Professor Fleming Jenkin, C. E., F. R. S., in a lecture delivered before the Philosophical Institution of Edinburgh, lately, of the formation of a Sanitary Protection Association, the purpose of which is to have inspections by scientific men, at stated periods, of the sanitary arrangements of the houses of its members. Thus will be afforded the privilege of having at any time the advice of an experienced sanitary engineer, to those whose means would scarcely, in their own mind, justify the end, by paying a heavy fee. The annual subscription of a guinea or so will be willingly paid by many, and the association should prove a successful addition to the sanitary working of the city. It has already received the promised support of the most eminent of the legal, medical and clerical gentlemen of Edinburgh.—*The British Architect and Northern Engineer.*

NEW ZEALAND RAILWAYS.—Mr. Carruthers, Engineer-in-Chief for railways in New Zealand, reports that at the close of June, 1877, there were 860 miles of railway opened for traffic in that colony, and 274 miles in progress, which are expected to be completed in 1877-78. In comparing this with the other colonies we find that Victoria comes next in its length of lines, having at the end of last year 702 miles open for traffic, and 259 miles more in progress, while New South Wales had only 509 miles opened, and 180 miles in course of formation. By adopting a gauge of 3 feet 6 in. the New Zealand Government has not only been able to construct its lines with greater speed than the railways made in Victoria and New South Wales, which have wide gauges, but it has also been enabled to make them at considerably less cost. In New Zealand the expenditure on the 860 miles of railway in operation has been £6,129,920, or an average of something over £7,277 per mile, while in New South Wales the average is £15,699, or more than double, in Victoria £21,354, in South Australia £8,480, and in Queensland £10,633 per mile.—*Colliery Guardian.*

THE ST. GOTHARD RAILWAY.—The cost of carrying out the original plan of the new line which is to connect the railways of Germany with those of Italy by way of St. Gothard would, according to a paper just issued from the German Chancellory, amount to 289 million francs, being 102 million francs in excess of the original estimate. The original scheme, which included several branch lines, has accordingly been cut down to such an extent that the first estimate will only be exceeded by 40 million francs. Of this sum the Governments of Germany, Italy and Switzerland have agreed to provide 28 millions—Germany and Italy each subscribing 10 millions, and Switzerland 8 millions—on condition that the St. Gothard Railway Company provides the remainder, or 12 million francs. The subvention which the three Governments had agreed to give on the original estimates was altogether 85 million francs, and will, therefore, be increased to 113 million francs, while the capital the company will have to raise will be 114 million francs. These final estimates now only await the approval of the German Federal Council, which, says *Herepath*, it is confidently expected they will shortly receive.—*The Engineer.*

HYDROCARBON OILS IN LAVA.—In the basaltic zone which reaches from the foot of Mount Etna in a south-southeasterly direction, near the village of Paterno, there is, says *Nature*, a pre-historic doloritic lava containing olivine, which surrounds the clay deposits of a mud volcano, and which has been examined by Sig. Orazio Silvestri. Under the microscope the lava shows an augitic principal mass with a quantity of olivine and many white transparent crystals of labradorite. The lava contains numerous round or irregular cavities which are coated with arragonite and which are filled with mineral oil. This oil, of which there is about 1 per cent. by weight in the whole mass, was taken from one of the cavities at 24 deg. Cent. At about 17 deg. Cent. it begins to solidify, and is of a yellowish-green tint by transmitted light, while by reflected light it is opalescent and light green. Chemical analysis of the liquid proved it to contain: Liquid hydrocarbons (boiling point 79·28 deg.), 17·97 per cent.; hydrocarbons solidifying under 0 deg. (b. p. 280 deg.—400 deg.), 31·95 per cent.; paraffine, melting point 52—57 deg., 42·79 per cent.; asphalte (leaving 12 per cent. of ashes), 2·90 per cent.; sulphur, 4·32 per cent.; total, 99·93 per cent.

THE FLAGSTAFF SILVER MINING COMPANY OF UTAH.—A suit was brought on February 27, in the Supreme Court of this city, against Ellis Pearson, of this company, by Erwin Davis, in which the plaintiff claims that the defendant has been guilty of "fraud, abuse of process and conspiracy," and places his damages at $311,170.70. The defendant says, or rather his counsel says for him—the defendant being a resident of London, where he is at present sojourning—that the suit will cause the thorough investigation of the affairs of the Flagstaff Silver Mining Company for six years, as also the stewardship of F. N. H. Patrick, for three years, its agent; that it will be an investigation into transactions involving millions of money, and that the cause of action arose in Great Britain, and will necessitate the issue of commissions to that country, and also to Utah. It is further alleged, on the part of Mr. Pearson, that the action is not brought in good

faith, but simply for the purpose of harassing the defendant; that the latter has had the claim set forth in the complaint adjudicated in the Supreme Court of Utah, upon a preliminary injunction proceeding in conjunction with the Flagstaff Silver Mining Company; that the plaintiff, as the defendant alleges, has taken judgment on the same claim against the company in Nebraska, by a void service on the chairman of the committee appointed by the company last summer, while passing through that State. Judge Donohue granted the application to compel the filing of security for costs, and fixed $1,000 as the amount of bonds to be furnished.

INDEX OF CURRENT TECHNICAL LITERATURE.

EXCHANGES.

[In this department will be given abstracts of the more important original articles contained in current technical periodicals at home and abroad.]

The following gentlemen have kindly consented to assist in making the reviews of current technical periodicals:

JOHN C. RANDOLPH, Mining Engineer, New York.
Prof. TROWBRIDGE, School of Mines, Columbia College, New York.
Prof. H. S. MONROE, " " " " "
Prof. T. EGLESTON, " " " " "
ARTHUR F. WENDT, Mining Engineer, New York.
MANSFIELD MERRIMAN, Yale Scientific School, New Haven, Conn.
FRANKLIN GUITERMAN, Mining Engineer, Cincinnati, Ohio.
Prof. P. deP. RICKETTS, Ph. D., School of Mines, New York.
Prof. E. A. FUERTES, Cornell University, Ithaca, New York.

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This department is opened for the benefit of miners, prospectors, and others interested in minerals.

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STATISTICS OF COAL PRODUCTION.

This is the only Report Published that gives full and accurate returns of the production of our Anthracite mines.

Comparative statement for the week ending Feb. 23, and years from Jan. 1:

TONS OF 2,240 LB.	1878. Week.	1878. Year.	1877. Week.	1877. Year.
Wyoming Region.				
D. & H. Canal Co..	53,317	400,885	35,983	280,603
D. L. & W. RR. Co.	28,889	298,797	39,000	286,120
Penn. Coal Co.....	437	87,426	13,090	114,703
L. V. RR. Co.....	36,043	132,008	14,754	143,078
P. & N. Y. RR. Co..	130	1,749	.....	5,602
C. RR. of N. J.....	22,928	98,036	28,283	147,041
	141,744	1,018,892	131,110	977,147
Lehigh Region.				
L. V. RR. Co.....	80,254	306,499	53,524	332,577
C. RR. of N. J.....	27,682	119,404	19,410	124,370
D. H. & W. B. RR..	.....	3,204	.....	2,657
	107,936	429,107	72,934	459,604
Schuylkill Region.				
P. & R. RR. Co.....	1,657	316,424	68,026	540,334
Shamokin & Lykens Val....	.....	49,334	2,858	51,299
	1,657	365,758	70,884	591,633
Sullivan Region.				
Sul. & Erie RR. Co.	740	5,635	222	1,983
Total.....	252,077	1,819,392	275,150	2,020,367
Increase.....	.....	.....	.....	.....
Decrease	23,073	200,975	.....	.....

The above table does not include the amount of coal consumed and sold at the mines, which is about five per cent. of the whole production.

Perth Amboy business:	Tons.
Received for the week	7,325
Shipped for the week	5,788
On hand Feb. 23	103,102

The increase of shipments of Cumberland Coal over the Cumberland Branch and Cumberland and Pennsylvania Railroads amounts to 728 tons as compared with the corresponding period in 1877.

The Exports of Coal from Baltimore for the week ending February 22 were 713 tons, and since January 1, 8,604 tons as against 3,757 tons for the corresponding time in 1876.

Belvidere Delaware Railroad Report for week ending February 23:

	Week.	Year. 1878.	Year. 1877.
Coal for shipment at Coal Port (Trenton)	.....	.....	.....
Coal for shipment at South Amboy	12,920	97,653	65,111
Coal for distribution	5,620	24,479	25,615
Coal for Company's use	2,611	13,549	12,282

The Production of Bituminous Coal for the week ending Feb. 23, was as follows:

Tons of 2,000 lbs., unless otherwise designated.

	Week. Tons.	Year. Tons.
Cumberland Region, Md.		
Tons of 2,240 lb.	7,885	100,228
Barclay Region, Pa.		
Barclay R. R., tons of 2,240 lbs.	6,542	47,654
Broad Top Region, Pa.		
Huntingdon and Broad Top R. R.	2,777	20,377
*East Broad Top	1,067	10,021
Clearfield Region, Pa.		
*Snow Shoe	869	4,820
*Tyrone and Clearfield	23,262	120,316
Allegheny Region, Pa.		
*Pennsylvania R. R	3,942	23,260
Pittsburgh Region, Pa.		
*West Penn. R. R.	3,543	5,493
*Southwest Penn. R. R.	381	4,234
*Penn & Westmoreland gas coal, Pa. R. R.	14,755	100,816
*Pennsylvania R. R.	6,954	44,467

*For the week ending Feb. 14.

The Production of Coke for the week ending Feb. 14:

Tons of 2,000 lbs.	Week.	Year.
West Penn R. R.	764	6,772
Southwest Penn. R. R.	12,275	90,331
Penn. & Westmoreland Region, Pa. R. R.	801	7,655
Pittsburg, Penn. R. R.	1,151	10,052
Total	14,991	114,810

COAL TRADE REVIEW.

NEW YORK, Friday Evening, March 1, 1878.

Anthracite.

The business of the past seven days has shown no improvement on that of several weeks previous, while the auction sale appears to have injured prices.

The Philadelphia *Ledger* of the 27th ult. says:

"The meeting of the Board of Control of what is termed the Coal Combination, held yesterday at the office of the Reading Railroad Company, was entirely satisfactory. All parties have completed the entry of securities, and deposit of the penalty fund, and all feel *now* that the programme is to be carried out in good faith for the year. As a further assurance of the willingness of all parties to restrict the output of coal until the market absorbs the coal now afloat and at tide water, the production of the month of March was fixed by the Board at 825,000 tons, divided thus: Philadelphia & Reading Railroad, 250,000 tons; Lehigh Valley Railroad, 150,000 tons; Central New Jersey Railroad, 125,000 tons; Delaware, Lackawanna & Western Railroad, 100,000 tons; Delaware & Hudson Canal, 100,000; Pennsylvania Railroad Company, 50,000 tons, and Pennsylvania Coal Company 50,000 tons, making a total of 825,000 tons."

This will show a curtailment by April 1, as compared with the first three months of 1877, of about 800,000 tons.

The Delaware, Lackawanna & Western R. R. Co.'s auction sale took place on Wednesday. The following quantities of coal were sold, and average prices realized, comparison being made with the January sale:

Tons.		Feb. 27.	Jan. 30.
5,000	Steamer	$3 11½	$3 09
7,000	Broken	3 07½	3 12½
6,000	Egg	3 15½	3 15
22,000	Stove	3 55	3 57
7,000	Chestnut	3 00	3 10½
3,000	Pea	2 12½	.....
50,000	Average	$3 23	$3 32

The above figures are a fair comparison of the markets of to-day and a month ago, prices being a shade weaker now. It is claimed that there is but very little coal "on the market," and that under the curtailment of production that is going on prices must be better soon. The supplies may in time be so well under the control of the combination that prices can be advanced; but to make such advance more than arbitrary, there will have to be a reduction in the output by August 1, as compared with the like period of 1877 of probably 4,000,000 tons. The question then is not, can a combination control prices, but can all the companies weather through to better times with the greatly curtailed business. If they do not, and the necessities of one or more of the companies compel it or them to break from the arrangement, there will probably be one of the severest wars of prices ever known in the trade.

The production of anthracite coal last week was 252,077 tons, against 128,849 tons the previous week, and 275,150 tons the corresponding week of 1877. The total output from January 1, has been 1,819,392 tons, as against 2,020,367 tons for the like period of last year, showing a falling off this year of 200,073 tons.

Bituminous.

Some of the larger consumers are looking about for their regular supplies; but so far there has been no important business done. The labor question in the Cumberland region is practically unchanged.

New York.

Retail Prices.

Per ton of 2,000 lb,

Anthracite.

	G. & Egg.	Stove.	Chest.
Pittston coal delivered	$5 00	$5 00	$5 00
Lack. coal, delivered below 59th St.	4 50	4 50	4 50
Wilkes-Barre, delivered above Canal Street	4 50	4 75	4 50
Wilkes-Barre, deliv'd below Canal Street	4 25	4 50	4 25
Lehigh and Locust Mountain, delivered above Canal Street	5 00	5 00	4 75
Lehigh and Locust Mountain, delivered below Canal Street	4 50	4 75	4 50

Bituminous.

Liv. House Orrel	$18 00	American Orrel	$11 00
Liv. House Cannel	18 00	Red Bank Cannel	7 00
Am. "	11 00	Cumberland	9 00
Ca'n'lt'n Bl'k, or splint.	10 00		

Wholesale Prices of Anthracite Coal f. o. b. at Tide Water Shipping Ports, per ton of 2,240 lbs.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
WYOMING COAL.						
Lackawana, at Weehawken	$3 25	$3 25	$3 25	$3 35	$3 75	$3 50
*Pittston, at Weehawken	3 25	3 25	3 25	3 35	3 75	3 50
Wilkesbarre, at Port Johnson	3 25	3 25	3 25	3 35	3 75	3 25
Lehigh Valley Coal Co., at Amboy	.....	3 50	3 25	3 35	3 75	.....
Plymouth R. A., at Port Johnston	.....	.....	3 25	3 45	3 85	3 35
LEHIGH COAL.						
Old Company's, at Port Johnston	3 75	.....	3 40	3 50	3 75	3 25
Honey Brook Lehigh, at Port Johnston	3 75	.....	3 40	3 50	3 75	3 25
Lehigh Valley Coal Co., at P. Amboy	3 75	.....	3 50	3 50	3 75	3 25
Mount Pleasant, at Hoboken	3 50	.....	3 50	3 50	3 75	3 00
Hazelton, at Hoboken	3 50	.....	3 50	3 50	3 75	3 00
Cross Creek, at Port Johnston	3 50	3 40	3 40	3 50	3 75	3 25
SCHUYLKILL COAL at Pt Johnston, Phila.						
Hard White Ash	3 25	3 25	3 25	3 25	3 50	3 00
Free-burning W. Ash	.....	3 25	3 25	3 25	3 50	3 00
Schuylkill Red Ash	.....	.....	.....	3 50	3 50	3 00
Lorberry	.....	.....	3 60	3 60	3 60	3 00
Lykens Valley Vein	.....	.....	3 75	3 75	3 75	3 25

*Forty cents per ton additional for delivery in New York.

Wholesale Prices of Bituminous Coal.

DOMESTIC GAS COALS.

Per ton of 2240 lb.	At the Shipping Ports.	Alongside in New York.
Westmoreland and Pennsylvania—		
At Greenwich, Philadelphia	$4 70	$5 50
At S. Amboy	5 00	5 50
Kanawha at Richmond	4 10	5 40
Red Bank Cannel, Pa., at Philadelphia	8 00	8 50
Youghiogheny, Waverly Co., at Balt	4 50	5 65
Despard, West Va.	4 50	6 00
Murphy Run, West Va., at Baltimore	4 50	5 85
Fairmount, West Va., " "	4 40	5 70
Newburg Orrel. Md. " "	4 50	6 00
Cannelton Cannel, West Va	....	10 00
" Splint " at Richmond	6 00	7 00
" Gas Coal at Richmond	4 00	5 65
Peytona Cannel, W. Va., at Richmond	....	10 00

MANUFACTURING AND STEAM COALS.

Cumberland at Georgetown and Alexandria	2 85@3 10	4 35@4 50
Cumberland, at Baltimore	3 10@2 25	4 35@4 50
Cl'rf'd "Eureka" and "Franklin."		
At mines	0 75	....
At Baltimore	3 25	4 50
At Philadelphia	3 25	4 50

FOREIGN GAS COALS.

	Sterling.	Am. cur'ncy.
Newcastle, at Newcastle-on Tyne	8s.6d.@10s.6d.	$5 50@ $6 00
Liv. House Orrel at Liv.	25s.	13 00
Ince Hall Cannell "	35s.6d.	18 00
" Gas Cannel "	25s.6d.	10 00@ 10 50
Scotch Gas Cannel, at Glasgow, nominal	25s.	7 50
	Gold.	
Bl'k House, at Cow Bay, N.S.	$1 75	$4 50
Caledonia, at Pt. Caledonia	1 50	4 25
Glace Bay, at Glace Bay	1 60	4 25
Lingan, at Lingan Bay	1 75	....
Intern'l Mines, at Sydney	1 75	4 50
Pictou, Vale Mines, at Pictou	2 00	4 70

Baltimore. Feb. 28, 1878.

Specially reported.

Wholesale Prices per ton of 2,240 lb.

In cars at Depot N. C. R. R.

HARD WHITE ASH, FREE-BURNING WHITE ASH, SHAMOKIN, ETC.

Lump and Steamboat	$4 15	Stove	$4 50
Broken	4 20	Chestnut	4 00
Egg	4 30		

LYKENS VALLEY RED ASH.

Broken, Egg and Stove	$4 55	Chestnut	$4 15

From yard or wharf to dealers, 75c. per ton additional for all kinds and sizes.

Boston. Feb. 23, 1878.

We reduce our quotations, freights having declined fully 25c. within a week or ten days. The rate from New York is now $1.25, and from Philadelphia $1.50@$1.60. Besides this, coal is still selling at the shipping ports under the combination prices. At retail $5.50 is the regular price for broken and $6 for stove, though several large retailers are cutting under. Cumberland coal is rather scarce, owing to the strikes in the mining region; we leave our quotations unchanged. The steamer Joseph Ferens, from Newcastle brought 1,360 tons, order; the steamer Stag from Newcastle, 702 tons, order; and the steamer Siberia, from Liverpool, 50 tons cannel coal order.

We quote wholesale prices as follows:

Anthracite, broken	$4 55	Caledonia	$4 50
" egg	4 55	Cannel, English	18 00
" stove	5 05	" Library	15 00
Franklin	5 75	" Buckeye	11 00
Cumberland	4 90@5 00	Penn	6 25
Clearfield	4 75@4 90	Youghiogheny	6 25
Westmoreland	6 25		

[Commercial Bulletin.

Buffalo, N.Y. Feb. 25, 1878.

[Specially reported by C. M. UNDERHILL.]

The Delaware, Lackawanna & Western Railroad Co. will sell their Scranton coal, the Delaware & Hudson Canal Co. will sell their Lackawanna coal, and J. Langdon & Co. will sell their Henry Clay and Mount Carmel Black Diamond coals, at the following prices per ton of 2,000 lb. for Buffalo local trade for the present:

	To DEALERS.		To CONSUMERS.
	On car or boat.	In yard, screened.	Delivered at yard. Retail.
Grate	$4 20	$4 30	$5 45
Egg	4 20	4 30	5 45
Stove	4 45	4 55	5 70
Chestnut	4 35	4 45	5 60
Blossburg	3 85	4 35	5 00

[Specially reported by LEE & LOOMIS.]

Per ton of 2,000 lb. delivered on cars.

	Lump.	Run of Mine.	Nut.	Slack.
Connellsville coke	$4 75	.....	.....	.....
Brookfield Coal	3 65	.....	.....	.....
Brier Hill	3 25	.....	.....	.....
Youghiogheny	4 00	.....	.....	.....
Monterey	.....	2 85	.....	.....
Catfish	.....	2 85	.....	1 90
Stoneboro'	.....	.....	2 50	1 90
Sterling Cannel	5 00	.....	.....	.....

Cleveland, O. Feb. 28, 1878.

[Specially reported by F. A. BATES, Esq.]

Per ton of 2,000 lb. f.o.b. vessels.

WHOLESALE.

Brier Hill (Church Hill)	$3 30
" " No. 2 Grades	3 10
Straitsville Lower Vein	2 75
Hocking Valley	2 75
Massillion (No. 2 grades 15 cents less)	2 75
Tuscarawas Valley	2 30
Columbiana	2 30
Nut coal, various grades	$1 90@2 20
Screenings " "	1 35@1 75
Youghiogheny gas coals	3 75

RETAIL TRADE.

	1 to 10 tons	
	Tons.	Upw'd
Brier Hill lump	$4 60	3 75
Massillon and Mineral Ridge lump	3 75	3 50
" " " nut	3 50	3 25
Straitsville Lower Vein and Hocking lump	3 60	3 35
" " " " nut	3 40	3 15
Rich Hill lump	3 50	3 35
" " nut	3 25	3 00
Columbiana, lump	3 00	2 75
" nut	2 50	2 35
Lacka'a., Wilkes-Barre and Pittston egg and grate	6 10	5 85
Lackawanna, Wilkes-Barre and Pittston stove	6 25	6 00
" " " chestnut	6 25	6 00

Lehigh $1 per ton higher.
All sales to be strictly cash with order or C.O.D.

Chicago, Ill. Feb. 28, 1878.

[Specially reported by Messrs. RENO & LITTLE.]

Retail prices of coal delivered per ton of 2,000 lb.

Lakawanna Stove	$6 75	Erie and Brier Hill	$5 50
" Chestnut	6 75	Wilm'gton & Ill.	$3 50@4 00
" Grate	6 75	Blossburg	6 50
" Egg	6 50	Piedmont	7 50

Cincinnati, O. Feb. 20, 1878.

[Specially reported by the Consolidated Coal & Mining Co.]

Per bushel of 72 lbs.

	Retail delivered.	Wholesale afloat.
Youghioghney	11c.	7½c.
Camden	9c.	5½c.
Cannel	17@18c.	13c.

Anthracite, delivered, $7@$8 per ton of 2,000 lbs.

Hamilton, Ont. Feb. 28, 1878.

[Specially reported by H. BARNARD.]

Retail prices delivered per ton of 2,000 lb.

Scr. or Wilkes-B. Grate	$5 00	Lehigh Lump	$6 00
" " Egg	5 00	Brier Hill	5 50
" " Stove	5 25	Massillon	4 50
" " Nut	5 25	Smithing	5 50

Indianapolis, Ind. Feb. 27, 1877.

[Specially reported by Messrs. COBB & BRANHAM.]

WHOLESALE BITUMINOUS.

On board cars, per ton of 2,000 lb.

White River	$2 65	Hocking Valley	4 25
Brazil Block	2 60	Raymond City	4 60
Highland, grate	2 25	Youghiogheny	4 60
Indiana Cannel	4 60	Blossburg (smithing)	6 10
Peytona	5 75	Piedmont "	6 10

Per car, 12 tons.

Block coal, nut	$18 00	Block Slack	$17 00
Highland, "	18 00		

RETAIL BITUMINOUS.

Delivered per bushel of 70 lb.

White River	13c.	Block Nut, steam use	8c.
Brazil Block	13	" Slack, "	7
Highland Grate	11	Virginia Cannel	25
Block Nut, domestic use	11	Youghiogheny	18
Highland Nut, " "	11	Blossburg	26
" " steam	8		

GAS COKE.

Per bushel, measure containing 2,888 cubic inches.

Retail, crushed	14c.	Wholesale	9c.
" lump	12		

ANTHRACITE.

Per ton of 2,000 lb.

Wholesale on Cars.		*Retail delivered.*	
Wilkes-Barre, all sizes	$5 75	Wilkes-Barre, all sizes	$7 50
Lackawanna, "	6 25	Lackawanna, "	7 00
Lehigh "	6 75	Lehigh, "	7 00

Louisville, Ky. Feb. 27, 1878.

[Specially reported by Messrs. BYRNES & SPEED.]

Wholesale per bushel of 72 lb.

Pittsburg	8c.	Raymond City	7½c.
Ashland (Ky.)	7	Kentucky, on cars	8

Retail.

Pittsburg	$3 00	Anthracite, per ton	$7 50
Raymond City	2 75	City Made Coke, per bsh	7c.
Ashland (Ky.)	2 50	Soft Coke, per bushel	7c.
Pittsburg nut	2 50		

Montreal. Feb. 28, 1878.

[Specially reported by Messrs. ROBERT C. ADAMS & Co.]

Wholesale per 2,240 lb.

Scotch Steam	$4 75	Cape Breton Steam	$4 25
Pictou	4 50	Newcastle Smith's	6 00

Anthracite at retail, per 2,000 lb. delivered.

Stove	$6 50	Chestnut	$6 00
Egg	6 00		

Milwaukee, Wis. Feb. 28, 1878.

[Specially reported by Messrs. R. P. ELMORE & Co.]

Retail price per ton of 2,000 lb.

Anthracite, Egg, Chestnut and Stove	$6 50		
Lehigh lump	$7 00	Connellsville coke on RR. track	7 25
Brier Hill	5 25	Straitsville	4 80

New Orleans, La. Feb. 22, 1878.

[Specially reported by Messrs. C. A. MILTENBERGER & Co.]

Stock good. Demand brisk.

PITTSBURG COAL.

At wholesale (by boat-load)	28c.	per bbl. of	180 lb.
To steamboats	45c.	"	"
" manufactories	45c.	"	"
" families	60c.	"	"

In hhds. (for shipment) $5.50 per hhd. from 5 to 6 bbls.

ANTHRACITE COAL

Per ton of 2,000 lb.

At wholesale	$7 00 to $8 00
To families, etc.	9 00 to 10 00

ST. BERNARD (KY.) COAL.

To steamboats	40c.	per bbl. of	180 lb.
" families	50c.	"	"
Virginia cannel to families	$1.00	"	"

Philadelphia, Pa., Feb. 14, 1878.

[Specially reported:—

The trade is excessively dull in all its branches. Schuylkill Company resumed work yesterday and will continue to work until the 9th of March, inclusive. The Lehigh region is idle this week, but resumes next Monday for one week. The amount of work done during the working periods being considerably more than the average winter work, and the weather continuing so spring-like, the supply of coal on hand continues to be large and the effect of the curtailments is not yet felt.

A drawback of 20c per ton on Eastern shipments takes place to-morrow at Port Richmond. This can hardly be called a reduction in tolls, which were put up so hurriedly and without any cause whatever, but expectations not yet realized. This decline leaves the Schuylkill trade still at a great disadvantage to compete against the rates ruling in New York.

Freights are tumbling down because of the scarcity of orders, and $1.25 to Boston is the ruling rate to-day—a very low rate for this season of the year.

February 28, 1878.

San Francisco, Cal.

From the *Commercial Herald* of February 21.

Imports from January 1 to February 1:

	Tons.		Tons.
Anthracite	1,399	Vancouver Island	5,311
Australian	8,148	Seattle	2,122
Coos Bay	3,360	English	13,836
Cumberland	152	Mt. Diablo	7,973
Bellingham Bay	1,700		

There has been one cargo sale of Wallsend this month at $7.50, and another at $7. The latter must be considered the present spot price, with no chances of any rise for a long time to come, as imports are expected to be large this summer and fall, while the output from the Seattle and other coast mines of the Pacific are expected to show a large increase over previous years. The receipts for the week past embrace the following cargoes from the North: Per Two Brothers, 1,880 tons Nanaimo; Aureola, 1,225 tons same, J. B. Bell, 1,100 tons Seattle, etc. The Whistler, from Seattle with 720 tons.

Pittston, Pa. Feb. 28, 1878.

Pennsylvania Coal Company's Coal in Yard.

Retail per ton of 2,000 lb.

Lump, Egg, and Stove	$2 25
Chestnut	2 00
Pea	1 00

Delivered, 50 cents per ton additional.

Richmond, Va. Feb. 28, 1878.

[Specially reported by S. H. HAWES, Dealer in Coal.]

Per ton of 2,240 lb. f.o.b.

Kanawha Cannel	$9 00	New River Bituminous	$3 70
Coalburg Splint	5 70	Clover Hill Coal	3 00
Lewiston	5 70	Norwood Gas and Steam Coal	2 70
Kanawha Gas Coal	4 90		

Sandusky, Ohio. Feb. 27, 1878.

[Specially reported by C. E. BLACK, Agent Con. Coal and Mining Company.]

We quote coal on cars at Sandusky, as follows:

Per ton of 2,000 lb.

ANTHRACITE.

	Grate.	Egg.	Stove.	Chest.
Lehigh	$6 50	$6 50	$6 50	$6 50
Wilkes-Barre	5 75	5 75	5 75	5 75
Lackawanna	5 75	5 75	5 75	5 75

BITUMINOUS.

Massillon	$3 00	Straitsville	$2 70
Del Carbo	2 75	Shawnee	2 70
Hocking Valley	2 70	Blossburg	4 75

Prices retailed delivered 50c.@75c. above car prices.

Freights.

Per ton of 2,240 lb.

Representing the latest actual charters to Feb. 27, 1878.

PORTS.	From Philadelphia.	From Baltimore.	From Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken.
Augusta, Me	.....	.....	.....
Albany	.....	.....	.....
Alexandria, Va	.....	.....	.....
Brooklyn, N. Y	.....	.....	.....
Bangor, Me	.....	.....	.....
Bath, Me	.....	$1 60	90
Baltimore	.....	.....	.....
Boston, Mass	$1 50@$1 55	1 55@1 60	80@90
Bridgeport, Conn.	.....	1 50	50
Bristol, R. I.	.....	.....	80
Beverly, Mass	.....	.....	80@90
Cambridge, Mass.	.....	.....	80@90
Charleston, S. C.	1 00	.....	.....
Danversport, Mas	.....	.....	.....
East Cambridge, Mass	.....	.....	.....
Fredericksbrg, Va	.....	.....	.....
Fall River	.....	1 50	70
Gloucester	.....	.....	.....
Georgetown, D.C.	.....	.....	.....
Hartford, Conn	.....	.....	.....
Hoboken	.....	.....	35
Hudson, N. Y	.....	.....	.....
Jersey City	.....	.....	35
Lynn, Mass	.....	.....	.....
Marblehead, Mass	1 47½	.....	.....
Middletown	.....	.....	90
Milton, Mass	.....	.....	.....
Nantucket, Mass.	.....	.....	90
New Bedford	.....	1 60	80
Newburyport	.....	1 60	1 00
New Haven	.....	1 50	50
New London	.....	1 50	50
Newport	.....	.....	70
New York	1 10@1 15	1 40	35
New Orleans, La.	.....	.....	.....
Norfolk, Va	.....	.....	.....
Norwich	.....	1 50	65
Norwalk, Conn	.....	1 60	55
Philadelphia	.....	80	.....
Portland	.....	1 60	80
Portsmouth, N.H.	.....	1 70	90
Providence	.....	1 50	70
Quincy P'nt, Mass	.....	.....	.....
Rockport	.....	.....	.....
Richmond, Va	1 12½	.....	.....
Saco	.....	.....	.....
Salem, Mass	.....	1 70	80@90
Saybrook, Mass	.....	.....	.....
Savannah, Ga	1 25	.....	.....
Somerset, Mass	.....	.....	75
St. John, N.B	1 40‖	.....	.....
Wareham	.....	1 60	.....
Washington	.....	.....	.....
Wilmington, N.C.	.....	.....	.....
Wilmington, Del.	.....	80	.....

* And discharging and towing. † And discharging. ‡ And towing. § 3c. per bridge extra. ‖ Gold.

St. Louis, Mo. Feb. 27, 1878.

[Reported by JAMES J. SYLVESTER, Secretary of the Anthracite Coal Association.]

Retail prices, delivered. Ton of 2,000 lb.

ANTHRACITE.

	Per ton.		Per ton.
Lackawanna	$8 00@8 50	Schuylkill	$8 00@8 50
Wilkes-Barre	8 00@8 50	Lehigh	9 00@9 50

BITUMINOUS.

Blossburg	$9 00	Big Muddy	$3 00
Pittsburg	4 50	Illinois Coals	2 50@3 00
Indiana Block	4 00	Connells. Coke	6 50

Toledo, Ohio. Feb. 27, 1878.

[Specially reported by Messrs. GOSLINE & BARBOUR.]

We report prices of coal on cars at Toledo as follows :

Ton of 2,000 lb.

Straitsville lump	$2 70	Hocking Valley nut	$2 30
" nut	2 30	Massillon lump	3 00
Shawnee lump	2 70	Cumberland	5 40
" nut	2 30	Blossburg	5 40
Hocking Valley lump	2 70		

Prices of hard coals on cars at Toledo areas follows :

Ton of 2,000 lb.

	Grate.	Egg.	Chestnut.	Stove
Pittston	$5 55	$5 55	$5 70	$5 80
Wilkes-Barre	5 55	5 55	5 70	5 80
Lackawanna	5 55	5 55	5 70	5 80
Lehigh	6 15	6 15	6 30	6 40

For retail delivery in city the prices are as follows : Stove and chestnut $6.45 ; grate and egg, $6.20 per ton ; Lehigh 60c. per ton additional.

Prices soft coal f.o.b. vessel for Lake shipments will be from 15 to 20c. per ton more than prices on cars.

OFFICE OF THE PA. & N. Y. R. R. Co. }
Bethlehem, Feb. 1. 1878. }

On and after this date the rate on coal for Buffalo, Watkins Ithaca and Weedsport, for water shipment; Auburn, for New York Central Railroad; Sterling,for Lake Ontario Shore Railroad, and Fair Haven, will be $1 per gross ton, between Coxton and Waverly. On coal for Rochester, via Erie R. W., Salamanca and points west thereof, an additional charge of 10 cents per ton will be made to cover transhipment charges at Waverly. The full rate from Coxton to Buffalo is $2.75, to Rochester $2.47. Local rates of August 6 will go into effect the same date.

ROBERT H. SAYRE, President.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, March 1, 1878.

American Pig.—Business could hardly be duller without ceasing entirely. This continued depression, as might be expected, is producing an injurious effect on prices. One great cause of so little business is the bad condition of the credits of a large number of buyers. Makers say they cannot afford to sell iron at cost, and then run a risk of getting nothing for it. Cash buyers can secure greater bargains now than at any time since the panic. There are indications that the pipe-founders, who were very large consumers of iron last year, will not take nearly so much during the coming season. We quote No. 1 foundry at $18 @$19; No. 2 foundry, $17@$18, and forge, $16@$17. In the present condition of the market, however, these prices are but nominal.

Scotch Pig.—The business in this article is still confined to small lots, making a total not worthy of consideration. We quote Eglinton $23@$23.50; Coltness, $25 @ $25.50, and Glengarnock, $24 @ $24.50.

Rails.—We learn of no business. There is a fair inquiry for steel rails. We quote these at works at $41.50 @ $43, and iron $33 @ $36.

Old Rails.—Without quotations we quote at $19.

Wrought Scrap.—A sale of 500 tons on private terms is reported at about $22 from yard.

Baltimore, Md. Feb. 25, 1878.

[Specially reported by Messrs. R. C. HOFFMAN & Co.]

The iron market remains unchanged and we continue last quotations, viz.:

Balt. Char	$29 00@$30 00	M. & White	$14 00@$15 00
Va. "	28 00@ 30 00	C'lC.B.Blooms	50 00@ 55 00
Anth.No.1	19 00@ 20 00	" " Billetts	55 00@ 60 00
" " 2	18 00@ 19 00	Refi'd Blooms	45 00@ 50 00
" " 3	17 00@ 18 00		

Buffalo. Feb. 21, 1878.

[Specially reported by Messrs. PALEN & BURNS.]

No. 1 Foundry	$20 91
No. 2 "	19 91
Gray Forge	18 91
American Scotch A 1	24 25
Cherry Valley B 1	23 25
" " No. 2	22 25

Chattanooga, Tenn. Feb. 25, 1878.

[Specially reported by J. F. JAMES, dealer in iron & metals.]

PIG IRON.—Nothing new to report in the condition of this branch of the trade since my last report. Demand unusually light for this time of the year. Prices unchanged.

BAR IRON.—The mills report a fair amount of orders on hand and running full time.

OLD RAILS, SCRAP AND OLD CAR WHEELS.—Good inquiry but very little to be obtained even at a fair cash price. The general condition of the trade is unsatisfactory.

Tenn., Ala. & Ga. Charcoal, No. 1 Foundry	$18 00@$19 00		
Tenn., Ala. & Ga. Charcoal, No. 2 Foundry	17 00@ 18 00		
Tenn., Ala. & Ga. Charcoal, Gray Forge	15 00@ 16 00		
Tenn., Ala. & Ga. Coke, No. 1 Foundry	19 00@ 20 00		
Tenn., Ala. & Ga. Coke, No. 2 Foundry	17 00@ 18 00		
Tenn., Ala. & Ga. Coke, Gray Forge	15 00@ 16 00		
Tenn., Ala. & Ga. old B. (car-wheel)	20 00@ 28 00		
Charcoal or Coke, white and mottled	14 00@ 15 00		
Old rails	$18 00@$19 00	Wr'ght scrap,	
Old car wh'ls.	16 00@ 17 00	No. 2	$12 00
Wr'ght scrap, No. 1	17 00	Cast scrap	10 00
		Muck bar	32 00@ 33 00

Iron Ores.

Red Hematite (about 55 per cent. metallic iron) f. o. c. at mines	$1 25
Brown Hematite (about 55 per cent. metallic iron)	1 75

Cincinnati, O. Feb. 26, 1878.

[Specially reported by Messrs. TRABER & AUBERY, Commission Merchants for the sale of pig iron, blooms, ore, etc.]

Below please find closing quotations of our pig iron market, viz. :

CHARCOAL.

H'n'g Rock	No. 1 Foundry & B 1	$22 00@$23 00	—4 mos.
"	No. 2 "	21 00@ 22 00	—4 mos.
"	Soft Silver Gray	20 00@ 21 00	—4 mos.
"	Mill	18 00@ 19 00	—4 mos.
Tennessee	No. 1 Foundry	21 00@ 22 00	—4 mos.
"	No. 2 "	20 00@ 21 00	—4 mos.
"	Mill	18 00@ 19 00	—4 mos.

STONE COAL.

Ohio	No. 1 Foundry	$20 00	—4 mos.
"	No. 2 "	19 00	—4 mos.
"	Nos. 3 and 4 "	18 00@ 17 00	—4 mos.
"	Mill	18 00	—4 mos.

COKE.

Ohio & W. Va.	No. 1 Foundry	$21 00	—4 mos.
" "	No. 2 "	20 00	—4 mos.
" "	Mill	18 00	—4 mos.

CAR-WHEEL.

H'n'g R., C. B	Hecla, Vesuvius, Etna, Jefferson.	$38 00	—4 mos.
Maryland,	" Cedar Point	37 00	—4 mos.
Missouri,	" Maramec	30 00	—4 mos.
Alabama,	" Woodstock	32 00	—4 mos.

BLOOMS.

Charcoal	$45 00@$50 00—cash.

SCRAP IRON.

Cast	40 c.@ 45c.—cash.
Wrought	62½c.@$1 00—cash.

Columbus, Ohio. Feb. 25, 1878.

[Specially reported by Messrs. KING, GILBERT & WARNER, dealers in Pig Iron and Ores.]

We have nothing new to report as to the condition of the pig iron market for the past week. The demand has been fair, although transactions are in small orders. The usual time, four months, allowed on following quotations:

FOUNDRY IRONS.

No. 1 Hanging Rock Charcoal	$23 50@$24 00
No. 2 " " "	22 00@ 22 50
No. 1 Hocking Valley soft and strong from pure limestone ores	21 50@ 22 00
No. 2 Hocking Valley soft and strong from pure limestone ores	20 50@ 21 00
No. 1 American Scotch	20 50@ 21 00
No. 1 Moxahala	21 50@ 22 00
No. 2 "	20 50@ 21 00
No. 1 Shawnee	20 50@ 21 0
No. 1 Eliza (Jackson County)	20 50@ 21 00
Silver Gray	18 00@ 19 00

MILL IRONS.

Gray neutral	18 50@ 19 00
Mottled and white neutral	17 50@ 18 00
Gray cold short	17 50@ 18 00
Mottled and white cold short	16 50@ 17 00

Cleveland, O. Feb. 23, 1878.

[Specially reported by Messrs. C. E. BINGHAM & Co.]

Per gross ton, on four months' time. Subject to change without notice.

FOUNDRY IRON.

No. 1	L. S. Charcoal	$24 00	Am. S., No. 1, Ch. Val. $22 00
No. 2	" "	24 00	" " B—1, " " " 21 00
No. 1	Anthracite	21 00	" " No. 2 " " " 20 00
No. 2	"	19 00	No. 1, Massillon 22 00
No. 1	Bituminous	21 00	B—1, " 21 00
No. 2	"	19 00	No. 2, " 20 00

CAR-WHEEL AND MALLEABLE IRON.

No. 3, L. S. Charcoal	$25 00	Nos. 5 & 6, L. S. Char.	$25 00
No 4, " "	25 00		

BESSEMER IRON.

Nos. 1 & 2, L. S. Char.	$24 00		

FORGE IRON.

No. 1, Gray	$19 00	White and Mottled	$18 00

Louisville, Ky. Feb. 26, 1878.

[Specially reported by Messrs. GEORGE H. HULL & Co.]

We have nothing new to report. Demand hardly up to last month, and prices hardly as firm. The usual time, four months, allowed on quotations below:

FOUNDRY IRONS.

	No. 1.	No. 2.
Hanging Rock Charcoal	$22 00@$23 00	$20 00@$21 00
Southern Charcoal	20 00@ 21 00	18 50@ 19 50
H'n'g Rock, Ste'l & Coke	20 00@ 22 00	19 00@ 20 00
Southern Stonecoal & Coke	19 00@ 20 00	18 00@ 19 00
"American Scotch"		20 00@ 22 00
Silver Gray		18 00@ 19 00

MILL IRONS.

No. 1 Charcoal, Cold-short & Neutral	$18 00@$19 00
No. 1 Ste'l & Coke, Cold-short & Neutral	17 00@ 18 50
No. 2 Ste'l & Coke, Cold-short & Neutral	16 00@ 17 00
No. 1 Missouri and Indiana, Red-short	20 00@ 22 00
White & Mottled, Cold-short & Neutral	14 00@ 16 00

CAR-WHEEL AND MALLEABLE IRONS.

Hanging Rock, Cold Blast	$34 00@$37 00
Alabama and Georgia, Cold Blast	24 00@ 33 00
Kentucky, Cold Blast	25 00@ 33 00

Milwaukee, Wis. Feb. 25, 1878.

[Specially reported by Messrs. R. P. ELMORE & Co.]

CHARCOAL IRON.

No. 1	Lake Superior per gross ton	$23 00	—4 mos.
" 2	" " "	22 00	—4 mos.

ANTHRACITE IRON.

No. 1	Anthracite per gross ton	24 00	—4 mos.
" 2	" " "	23 00	—4 mos.

STONE COAL AND COKE.

Warner's Am Sc'th (Bk. Band, per ton		$25 00@	—4 mos.
Soft Silvery per ton		22 00@23 00	—4 mos.
Ohio Stone Coal		22 00@23 00	—4 mos.

CAR WHEEL.

Lake Superior ores per ton	$25 00@27 00—4 mos.

Philadelphia, Pa., Feb. 28, 1878.

[Specially reported by JUSTICE COX, JR., & Co., Iron Merchants, 333 Walnut street, Philadelphia.]

Pig Iron.—This month will be remembered by all live men as being one of the dullest for at least two years, and this week the dullest of the month. The inquiries have been few and sales fewer, the only iron moving is iron sold last month, with some few sales for prompt delivery, in all amounting to about 1,000 tons of all grades. Prices, however, are firm, and all contend if Congress will only come to some decision on the important bill now before them we would yet have a fair Spring business, but with the uncertainty of everything at Washington it is impossible to get capital to invest in new enterprise. We quote: No. 1, $18 to $20; No. 2, $17 to $18; No. 3, $16 to $18; all Philadelphia delivery.

Manufactured Iron.—Bars continue dull, with sales only for immediate use. Mills will not accept the low prices offered by dealers, and assert they would rather shut down their mills than accept prices ruling last month. First-class irons are selling at full quoted prices, while poor goods cannot be moved at any price. In tank and plate little if any new business in reported. Mills making this class of iron are running out of orders, but it is hoped next month will bring something in the way of orders. Nothing is reported in skelp. We quote bars 2c. for best refined. Plate and tank, 2⅞ to 6c. ₱ lb. Skelp, 2 to 2 2-10c. ₱ lb.

Rails.—Nothing new is reported in steel rails; prices are about as older lot, $41 to $43 at mills.

Iron Rails.—There is much inquiry for iron rails, but only in small lots, however. We quote $33 to $35 at mills.

Old Rails.—The demand continues for old rails of known quality, and thus continues firm. We quote $20 to $21, and report sales of 500 tons at $20.50, Philadelphia.

Scrap.—There is little doing in scrap. We quote wrought dull at $20 to $24; C. M., $12 to $16, all Philadelphia.

Muck Bars are quoted $32 to $35, as to quality.

Pittsburg, Pa. Feb. 26, 1878.

[Specially reported by A. H. CHILDS.]

	4 mos.		4 mos.
No. 1 F'dry	$20 00@$21 50	M. & White	$16 00@$17 00
No. 2 "	19 00@ 20 00	Hot Blast Ch.	20 00@ 25 00
Gray Forge	17 50@ 20 00	Cold Blast W.	@ 35 00

St. Louis, Mo. Feb. 26, 1878.

[Specially reported by Messrs. SPOONER & COLLINS, Commission Agents for all kinds of Iron.]

We notice some little improvement in trade the past week, but prices are very low with no probable improvement for some time to come.

COLD BLAST CHARCOAL—ALL NUMBERS.

Hanging Rock	$25@$34	Assorted Bar Iron	$2, rates.
Tennessee	26@ 30	No. 1 Wr'ght Scarp,	80c. cwt
Kentucky	25@ 30	Heavy cast "	65c. "
Missouri	26@ 28	Light " "	55c. "
Georgia	24@ 26	Old rails	$20 00@$20 50
Alabama	24@ 26	Old carwheels	17 00@ 18 00

	No. 1.	No. 2.	Mill.	White and Mottl'd
Missouri stone coal	$20 50	$21 00	$20 00	$19 00
" charcoal	20 50	19 50	18 50	18 00
Tennessee charcoal	22 00	21 00	19 00	17 00
Tenn. coke very soft and strong	21 00	20 00	19 00	17 50
Hanging Rock charcoal	25 00	24 00	.....	.....
" " cold short	22 00	21 00	.....	.....
	ExNo.1	No. 1.	BNo.1.	No. 2.
Alice Hanging Rock coke.	$24 00	$23 00	$22 50	$21 50
Quinnimount, W.Va., coke.	24 00	22 50	21 50	20 50

METALS.

NEW YORK, Friday Evening, March 1, 1878.

In the metal trade this has been an exceedingly dull week, and prices have shown an inclination to find bottom, if there is such a thing. The passage of the silver bill has had no effect on the general market. It is thought, however, that as it is now a fact, it will be much better than the uncertainty we have had hanging over us since the beginning of the present session of Congress.

Gold Coin.—The price of gold has ranged from 102⅛ to 101¼, closing at 101⅛.

Bullion.—The market opened higher in London under the speculative operations of the previous week, and on Tuesday reached 55¼d. ; but has since receded, and is now quoted at 54⅞d. to-day. Whether this advance was due to influences from this side, and had any connection with a considerable sale of bullion made to our Government on the day the highest figure (55¼d.) was reached is a question that requires solution. It is not probable that our use of silver under the new law will, of itself, have much influence, except that it may steady the market, and could not prevent a serious decline should the demand for India lessen very much, as is likely, and should Germany continue large sales of silver, as of late. The quotations here are 118¾@119; in San Francisco, 8 per cent. discount. Gold bars are quoted at ⅛@¼ per cent. premium.

DATE.	London Pence.	N. Y. Cents.	DATE.	London Pence.	N. Y. Cents.
Feb. 23	54 15-16	118¾	Feb. 27.	55	118¾
Feb. 25	55	118¾	Feb. 28.	55	118¾
Feb. 26	55¼	119¼	Mar. 1.	55⅛	1°8½

SAN FRANCISCO, February 28, 1878.

Trade Dollars Sent East from San Francisco.—According to the express companies' reports, 811,000 trade dollars were shipped East during the month of February, of which 364,000 went during the last half of the month.

UNITED STATES OFFICE BUSINESS FOR FEBRUARY.

Deposits of gold		$1,057,000
Deposits of silver—Miscellaneous	$56,000	
Colorado	350,000	
Idaho	7,000	
Lake Superior	2,000	
Montana	28,000	
Nevada	225,000	
New Mexico	34,000	
Utah	150,000	
Arizona	1,000	
		853,000
Total deposits		$1,910,000

BULLION SHIPMENTS.

We give below a statement showing the latest bullion shipments, in addition to those announced in our issue of February 23:

February 15.	Tybo Con.,	Nevada	$25,488
" 16.	Northern Belle,	"	7,636
" 18.	Alps.	"	6,572
" 15.	Bechtel,	"	10,662
" 16.	California,	"	234,890
" 16.	Con. Virginia,	"	233,755
" 17.	Raymond & Ely,	"	7,430
" 15.	Standard,	California	17,991
" 17.	Grand Prize,	Nevada	43,800
"	Gold Hill,	Idaho	15,961

Gilpin County Bullion Shipments.—The bullion shipments from this county for January, are estimated at $220,949.

The Leopard Mining Co., Nevada, produced last year 685 bars of bullion, valued at $1,047,750. During the first half of February, the shipments of treasure, overland, by Wells, Fargo & Co., aggregated $1,179,451—of which $660,000 was in gold coin, and $446,910 in trade dollars.

Copper.—The sales for the week will probably aggregate from 200,000 to 300,000 lb., at 17¼@17⅛c. The asking price is 17¼c., while 17c. is bid. Purchases could undoubtedly be made at 17⅛c. The market is very weak and will undoubtedly continue so, until a large portion of this year's production is provided with a market by a large export contract.

In London, the quotations, according to latest cable advices were £66 for Chili bars and £73 for best selected.

Tin.—There has been a rumor of a sale of 1,000 slabs of straits to arrive at 14¼c. This lacks confirmation. There is no important business doing. We quote, in gold, as follows: Straits, 14½@14⅝c.; L. & F., 14⅝@14¾c., and Refined nominal at 15c. Straits in London, to-day, is quoted at £64. Earlier in the week the Singapore market was quoted at $18.75, and Penang, 18, with exchange at 4½d.

Tin Plates.—There is only a jobbing business in these. We quote in gold per box, as follows: Charcoal tins, $5.87½@$6.12½, and ternes, $5.75@$5.70; coke tins, $5.25@$5.37½, and ternes, $5.37½.

Messrs. Robert Crooks & Co., of Liverpool, say of tin and terne plates: "We are able to reduce our quotations for sundry brands, and purchases are practicable on very favorable terms. Charcoal tins maintain their price better than cokes. Ternes are fairly steady, as are coke ternes; but coke tins, owing to competition with second-hand lots, are very unsettled; price is 16s. 6d. to 16s. 9d. for ordinary grade, but these lots are obtainable at 3d. less.

Lead.—We are reported a sale of 200 tons of Missouri soft at 3¾c. The market is now very quiet, nominal and weak, and tending very rapidly to an export business from this port. We quote $3.70@$3.75.

Spelter and Zinc.—Spelter is very quiet and lower, the quotations being 5¼@5⅝c. Sheet zinc is also lower and quiet, and quoted at 6⅛@6¼c.

Antimony.—The lack of stocks has curtailed business. 50 casks, which arrived during the week, were promptly sold from dock. Cookson's is quoted at 12¾@13c., gold, and Hallett's at 12½c.

Quicksilver.—The San Francisco *Commercial Herald* of February. 21, says: "The Australia, for the Colonies, carried 90 flasks. The market continues undisturbed, with comparatively a light stock and restricted receipts, by reason of impassable roads, etc. Price, 42½@43c. Receipts for week, 248 flasks."

FINANCIAL.

New York Stocks.

NEW YORK, Friday Evening, March 1, 1878.

About 110,000 shares constitute the week's business in coal stocks on the New York market. With a single exception, the quotations are lower—the dealings throughout the week have been very irregular and it is generally believed that, were not the market artificially supported, we should see materially lower prices. The stock of the Delaware & Hudson Canal Company has ranged from 45⅝ to 47½, and closes at 46¾, the sales for the week amounting to 14,500 shares. Delaware, Lackawanna & Western Railroad stock closes at 47⅜, with transactions amounting to 90,000 shares. New Jersey Central is lower, probably under the influence of the new scheme of organization recommended at a recent meeting of the joint committees of the stock and bondholders. This stock has sold throughout the day and closes at $16 per share against $17.37½ a week ago. The sales amount to about 4,000 shares.

The N. Y. *Tribune* recently published the following statement of the Morris & Essex Railroad from the annual report filed with the Controller of the State of New Jersey:

Report for year ending Dec. 31, 1877.

Capital stock		$15,000,000 00
Funded debt		19,746,000 00
		$34,746,000 00
Less sundry assets, etc		950,490 55
		$33,795,509 45
Cost of railroad	$17,551,083 02	
Cost of equipment	12,140,592 13	
Cost of piers and docks at Hoboken, say	3,429,839 68	
Cost of canal at Hoboken, unfinished	673,994 62	
		33,795,509 45

Gross earnings during year, as follows:

From passengers	$770,493 68	
From merchandise	643,902 88	
From coal	1,729,436 15	
From other sources	224,608 34	
		$3,368,441 05

Expenditures during year, as follows:

Maintenance of way	$517,320 86	
Repairs to machinery	254,396 18	
Operating expenses	1,374,216 66	
		$2,145,933 70

As the above capital stock and bonds are guaranteed at 7 per cent. per annum by the Delaware, Lackawanna & Western R. R. Co., this company must have lost on this one of its leased roads some $1,209,713, even after charging as freight on coal $1,729,436 on a business of certainly not more than as many tons. Add to this loss the deficiency of $1,922,660 in the coal department of the Delaware, Lackawanna & Western Co., and we have a total deficiency from these two items alone of $3,132,373. As there was paid, according to official reports, a further amount of at least $847,816 for interest on bonds and rents of branch railroads, it would seem that there is a total loss of $3,980,189 to be overcome by transportation profits on the Delaware Lackawanna main line and its northern leased lines.

The northern coal business of 1877 was by no means either a large or a profitable one. It seems incredible that the main line business was so profitable as to leave the total net loss only $908,021, as stated in the report recently to the Auditor General of Pennsylvania, and if this statement is not correct it is certainly of interest to the stockholders to know it. Nor is this the only coal report that appears to have been strained to the utmost limit of elasticity to make the stockholders and the public believe them solvent.

Several months ago we were abused for our criticism of the report of a committee appointed to investigate the affairs of the Delaware & Hudson Canal Company, which said that the company could make its fixed charges (said to be $1,000,000 per annum, after deducting profits from all other sources except coal), at $3 per ton for coal. In an investigation of the coal combination by a legislative committee in this city during this week, Mr. Dickson, President of this company, in his evidence, said that his company paid to individual miners $1.25 per ton for coal. If he could mine coal for a less cost with his excessive productive capacity he would not be likely to pay this sum. He furthermore says that the average cost of transportation to this city is $1.50 per ton. These two items alone make a cost of $2.75 per ton, and any one who has knowledge of the business can easily see that there are additional charges which will bring the amount up to $3 at least, while the committee acknowledged that the company would have to earn $1,000,000 on coal to pay its fixed charges, or on last year's business, and on that likely to be done this year, 50c per ton additional. Mr. Dickson says that $3.25 is the lowest price at which coal can be delivered here without loss. We suppose he does not include fixed charges in this item, and this would be within 2c. of the amount ascertained by us from the committee's report, an endorsement by high authority of the correctness of our statements. There are some other deductions in our analysis of this report which President Dickson can still adopt with advantage.

BALTIMORE, Md., February 28.

Northern Central R. R.—The annual meeting of the stockholders of the Northern Central Railway Company was held to-day. The annual report of Col. Thomas A. Scott, President, for the year ending December 31, 1877, gives the revenue of the road and leased and controlled lines at $4,070,387.78, and the total operating expenses at $2,745,924.34, leaving as net earnings $1,324,463.44. In comparison with the year 1876, there was a decrease in ne earnings of $299,537.72, equal to 6·85 per cent. The total expenses for 1876 were $3,242,325.62; the expenses for 1877 were $2,745,924.84, showing a decrease in expenses in 1877 of $496,400.78, or 15·31 per cent. less than in 1876, and an increase in the net earnings of $196,863.06. In addition to the net earnings, as above stated, there was received from dividends and interest, $184,814.33, and a contribution for operating the Elmira, Chemung & Canandaigua divisions (from the Pennsylvania Railroad Company) of $65,770.23, making total net receipts of $1,575,047.50. The net receipts were applied to the payment of the interest on the lien to the State of Maryland, mortgage indebtedness, etc., leaving a balance of net income for 1877, carried to the credit of profit and loss, of $61,705.30.

American Coal Company.—Statement of profits for the year ending December 31, 1877:

Received for coal, sold and delivered, earnings of canal boats, rent, and interest		$383,647 60
Excessive transportation, charges of 1876 refunded		26,980 18
Coal on hand, value		29,962 00
Total		$440,599 78
Canal and R. R. transportation	$219,948 84	
Mining, superintendence, labor, etc	96,563 10	
Shipping expenses, Alexandria, Baltimore and Jersey City	29,943 43	
Taxes	5,874 62	
Salaries, office and contingent expenses	17,952 97	
Legal expenses	4,079 45	
Scrip and bond interest to March 1, 1878	7,271 34	
		382,533 75
Earnings of 1877		$58,066 03
Surplus, December 31, 1876	$214,262 89	
Deduct dividend September, 1877	37,500 00	
		176,762 89
Add earnings of 1877		58,066 03
Total		$234,828 92
Deduct allowance for depreciation on canal boats and other personal property		19,415 85
Present surplus		$215,413 07

Coal sent from Mines, 1877.

	Tons.
To Baltimore	24,747·15
To canal	92,415·16
To line of railroad	270·16
Total	117,434·07

For the year past the above is a very encouraging statement to stockholders. After deducting "Excessive transportation charges of 1876," it shows a profit of about 26c. per ton on all coal mined. Equal to a profit of over 2 per cent. on the capital stock of $500,000, or about 6 per cent. on the latest price bid for the stock.

The Maryland Coal Company. This company has issued a statement showing that its net profit last year was $9,248.11. The report of the President speaks of the great disadvantages the company labored under, and the unusual competition from anthracite coal. However, this is the third report of coal companies in the Cumberland region showing a profit, which is a proportion that speaks well for the future of this field.

Cumberland & Pennsylvania Railroad Co.—$5,000 of the 6 per cent. bonds due 1891, $1,000 each, sold at auction during the week at 85 per cent.

Union Mining Co. of Indiana.—40 shares of this company's (par $100) stock sold at auction during the week at $24.50 per share.

Coupons on the bonds of the following companies fall due during the present month:

American Coal Co.—Coupons.
Cameron Coal Co.—Coupons due.
Cleveland & Mahoning Valley R. R. Co.—Coupons.
Holly Waterworks, Columbus, Ind.—Coupons.
Consolidation Coal Co., of Ind.—Cumberland & Pennsylvania R. R. first mortgage bonds; coupons.
Delaware, Lackawanna & Western R. R. Co.—Second mortgage and Lackawanna & Bloomsburg first mortgage extension; coupons.
Himrod Furnace Co.—Coupons.
Kemble Coal & Iron Co.—Coupons.
New Boston Coal Mining Co.—Coupons.
Reading & Columbia R. R. Co.—Coupons.
Schenectady & Duanesburgh R. R. Co.—Coupons paid by Delaware & Hudson Canal Co.
Spurr Mountain Iron Mining Co.—Coupons.
Straitsville Cannel Coal Co., of N. Y.—Coupons
Union Iron Co., of Buffalo, N. Y.—Coupons.
Warren R. R. Co.—Conv. bonds; coupons paid by Delaware, Lackawanna & Western R. R. Co.
Watertown Waterworks.—Coupons.
Wheeling Iron & Nail Works Co.—Coupons.

Philadelphia Stocks.

PHILADELPHIA, Friday Evening, March 1, 1878.

A very fair business has been done in coal shares during the week just closed at irregular quotations. The total transactions amount to over 100,000 shares. The stock of the Lehigh Coal & Navigation Company is exceptionally strong, the quotation to-day showing a decided advance on any previous quotation of the week. Lehigh Valley has been very steady, but sparingly dealt in. Philadelphia & Reading and Pennsylvania Railroad stocks are a little off, and have absorbed the bulk of the week's business. The fluctuations in the stock of the United Companies of New Jersey have been one of the prominent features of the week. The *Ledger* of the 27th ult. says:

"Three hundred and seventy shares of United Companies of New Jersey, opening and closing at 111½, with sales during the day as low as 109½, a difference of 2 per cent. The fluctuation in the price of this stock was wider than any other on the list, and, so far as we can learn, is without the slightest reason, as is also the decline of about 10 p. c. on the same within the last few weeks. We have diligently inquired at the office of the company and elsewhere, and cannot learn from any one any cause for a decline in United Companies that does not apply with equal force to every other stock on the list. The stock market generally is depressed, arising from distrust of the future, but holders of any one stock show little wisdom in working up a panic to their own and others' prejudice. Get the facts first, and then act according to best judgment, is the

wiser course. If there is anything in the wind in reference to the stock of the United Companies we have failed to find it out."

Lehigh Coal & Navigation Company.—We take the following review of the annual report of this Company from the *Ledger* of Feb. 28:

"The report of E. W. Clark, President of the Lehigh Coal & Navigation Company, for 1877, which was read at their annual meeting on the 26th, shows that the Company during that year received from all sources $994,666, and disbursed for rentals, interest, taxes and general expenses, $1,189,321, leaving a deficit of $194,655, which was charged to the dividend fund, reducing this fund on December 31, 1877, to $463,033. There were carried during the year 3,116,169 tons of coal, an increase of 80,942 tons over the previous year, and of this tonnage 2,150,660 were produced by the Lehigh & Wilkes-Barre Coal Company. The report treats at length of the relations of the Company with the New Jersey Central Railroad, and reviews the history of the amicable arrangements, already described in the *Ledger*, by which the Company resumed possession of its canals and mines. When possession was resumed, final settlement of accounts was thus made. There were due by the New Jersey Central Railroad, for rentals and loans, $750,119, of which $398,470, was paid in money and $42?, 709 in personal property, and the balance of $308,940 was credited to the Lehigh Navigation Company on the New Jersey Central's construction loan account. At the same time the Lehigh & Wilkes-Barre Coal Company, on final settlement, owed the Navigation Company $236,977, which was secured on the Coal Company's mines. In final settlement of the construction loan account with the New Jersey Central Railroad, various adjustments were made which reduced the debt of $974,-425 due the railroad at the opening of the year, to $368,-985 at the close of the year. In making this reduction no money was paid, but the Navigation Company paid the railroad various securities it held, and also got the benefit of the credit of $308,940 above mentioned. This reduction was of great benefit, as the Navigation Company was paying 7 per cent. interest on this construction loan account. Since April 1, 1877, the Navigation Company have resumed operating their own canals and mines, and have received the net earnings from both. The improvements made by the New Jersey Central Railroad, at a cost of over eleven hundred thousand dollars, and the advanced royalties of over seven hundred thousand dollars, were abandoned to the Navigation Company, without compensation, when the property reverted, subject, however, to a right of redemption until July 1, next. The report estimates that the annual charges on the Company for interest, rentals and general expenses are $1,328,700, while the average annual income during the last three years that the Company managed its own mines and canals was $1,639,666. The report also says: Although the present value of the improvements is very much less than their cost, the mines are in much better condition, and have a productive capacity of over one hundred thousand tons a month; no further expensive improvements will be necessary for several years. These facts should be considered by the stockholders in their estimates of the future prosperity of this company. The mines thus greatly improved are capable of producing a large tonnage at less cost than formerly, and as the product is nearest to market, and commands the highest price, it is not unreasonable to anticipate large returns in the future. The report, while describing the operations of a year of great depression in the coal trade, gives a thorough statement of the Company's affairs, and shows that its management has been prudent and wise."

Pennsylvania Canal Company.—The annual statement of the Treasurer of this Company shows the receipts to have been $504,301.26, including a cash balance at the commencement of the year of $113,968.82, while the expenditures were $431,229.51, leaving a cash balance in bank and deposited on call of $73,071.75. The Company owns 209 boats, at a net cost, including repairs during the year, of $235,129.05. The number of tons moved was 772,190, against 880,652 tons in 1876.

Philadelphia & Reading R. R.—We give below a comparative statement of gross receipts, tonnage and passengers of this company for the month of January:

Gross Receipts.

	Jan. 1878.	Jan. 1877.
Railroad traffic	$610,768	$711,729
Canal traffic	992	386
Steam colliers	62,162	68,446
Richmond coal barges	56	243
Total Railroad Co	$673,980	$780,806
Reading Coal & Iron Co	364,134	431,037
Total of all	$1,038,114	$1,211,843

Tonnage and Passengers.

Tons of coal on railroad	231,233	343,747
Tons of merchandise	246,314	267,144
Passengers carried	541,600	552,763
Coal transported by steam colliers	49,662	28,042

Tons of Coal Mined.

By Coal and Iron Company	96,935	146,082
By tenants	36,121	71,027
Total mined	133,056	218,009

The above comparative statement of the traffic for the month of January, 1878, and corresponding month last year, which, considering the suspension of mining, is very good—better, indeed, than was expected. Notwithstanding the suspensions of mining and rigid curtailment of coal production last month, the net profits of the two companies, *i. e.*, the Reading Railroad Company and the Coal and Iron Company, for the first two months of the present fiscal year, after the payment of all expenditures for dead work and new improvements by the Coal and Iron Company, and all leases, both of canals and railroads, by the Railroad Company, were $253,385 greater than those of the corresponding period of last year.

Pennsylvania R. R.—The figures of an official statement of the business of the Pennsylvania Railroad Company, on all lines east of Pittsburg and Erie, for January, 1878, as compared with same month in 1877, show an increase in gross earnings of $12,730; a decrease in the expenses of $137,947; an increase in net earnings of $150,677. All lines west of Pittsburg, for the month of January, 1878, show a profit over all liabilities of $143,155. This is quite encouraging, and tells favorably for the steadily improving condition of the Pennsylvania Railroad Company.

Pennsylvania R. R Co.—The annual meeting of the stockholders of this Company will be held March 12.

Delaware Water Gap Slate Co.—This Company will hold its annual meeting March 6.

Nesquehoning Valley R. R. Co.—The semi-annual dividend period of this Company occurs during the present month.

The Locust Mountain Coal Co. has its semi-annual dividend during the present month.

Coupons and interest on the bonds of the following companies will fall due during the present month:

Barclay Coal Co.—Dividend on stock of this company is payable.

Belvidere Delaware R. R. Co.—Second mortgage; guaranteed by Camden & Amboy R. R. Co.; coupons.

Connecting R. R. Co.—First mortgage; coupons paid by Pennsylvania R. R. Co.

East Pennsylvania R. R. Co.—First mortgage bonds; coupons due.

Lehigh Coal & Navigation Co.—Convertible bonds; coupons paid in gold.

Lehigh Valley R. R. Co.—Seven per cent. bonds; interest.

New Jersey United Railroads—Loan of 1901; interest paid in gold.

Pennsylvania R. R. Co.—Cons. mortgage reg. bonds; interest.

Pennsylvania & Delaware R. R. Co.—Income bonds; coupons due.

Schuylkill Navigation Co.—First mortgage bonds; interest.

AUCTION SALES.

Chester Valley R. R., 19 shares consolidated stock at $10 per share.

Perkiomen R. R., 10 shares at $30 per share.

Huntingdon & Broad Top Mt. R. R., $4,000 consolidated mortgage 7 per cent. bonds at 24 per cent.

Pennsylvania Canal Co., $3,000 6 per cent. coupon bonds at 59 per cent.

Miscellaneous Stocks and Quotations.

Sales and quotations of the stocks and bonds dealt in here, at Philadelphia and Baltimore for the week ending the 28th ult. are given in the following tables. The Philadelphia quotations will have a * affixed. The Baltimore quotations are indicated thus †.

STOCKS.	Par Value.	High'st	Lowest	Closing	Sales: Shares.
American Coal Co.	$25	.....	.....	32	.....
St. L., I.M.& S.R.Co.	100	6	5	4½	272
Spring Mt. Coal Co.	50	.....	.....	35	.....
*Cambria Iron Co.	50	.....	.....	51	.....
*Penn. Salt Mf'g Co.	50	.....	.....	60	.....
*Westm'land C. Co.	50	.....	.....	65	.....
*Buck Mt. Coal Co.	50	.....	.....	30	.....
*Schuyl. Nav. Co.	50	.....	.....	.....	.....
†Balt.& O.RR.Co.pf	100	94	.....	.....	.....
" " " " com	100	85	83¾	.....	155
†George's C'k C. Co	100	.....	.....	92	10
†S. Clara M'g Co.	100	.....	.....	.....	.....
†Atlantic Coal Co.	10	.....	.....	1.20	.....

BONDS.	Princ'l. When Due.	Int'est. When Due.	Hig'st.	Lowest	Amount.
D., L. & W., 7s, conv	1892	J. & D.	.....	.....	.....
" " " 2d mtge.	1881	M. & S.	.....	107¼	.....
N.J.C., 1st mtge. new	1890	F. & A.	110½	.....	$6,000
" " " 1st mtge., con	1899	Q.	66½	65¾	3,000
" " " convt.	1902	M. & N.	65¼	65	7,000
Lehigh & W. B., con	1899	Q.	35	34½	5,000
Am. Dock & Imp. 7s	.....	J. & J.	43¼	43	36,000
St. L. I. M. & S., 1st mt	1892	F. & A.	104⅛	104	3,000
Ches. & O., 1st mtge	1899	M. & N.	.....	22	.....
D & H C Co., 1stm.rg	1884	J. & J.	96	.....	10,000
" " " " "	1891	J. & J.	98	.....	4,000
" " " " m.loan cp	1894	A. & O.	.....	96	.....
" " " " " rg.	1894	A. & O.	96	.....	4,000
" " " " new mge.	.....	.....	.....	.....	.....
*L.V.R., 1stm.6s.cp.	1898	J. & D.	.....	.....	.....
" " " " rg.	1898	J. & D.	111½	111¼	2,000
" " " 2d m. 7s, rg.	1910	M. & S.	112	.....	1,100
" " " con.m.6s, rg	1823	J. & D.	97½	97¼	5,000
" " " 6s cp.	1923	J. & D.	97	.....	6,000
*Pa.RR., 1st m.6s, cp	1880	J. & J.	104¼	.....	6,000
" " g. m., 6s, cp.	1910	J. & J.	107	.....	5,000
" " " 6s, rg.	1910	A. & O.	.....	108½	.....
" " con.m.6s, rg.	1905	Q.	.....	92	.....
" " " 6s, cp.	1905	J. & D.	.....	92	.....
" " new loan, 5s	.....	.....	110¾	110½	27,400
*P.& R. R., 1st m.6s, R. C. 43-44	1880	J. & J.	.....	103	.....
P. & R. R., 1st m. 6s, R. C. 48-49	1880	J. & J.	.....	.....	.....
P.& R. R., 2d m. 7s cp	1893	A. & O.	.....	112	.....
" " " scrip.	1882	J. & J.	60	59⅞	2,400
" " " in.m. 7s, cp	1896	J. & D.	.....	.....	.....
" " " c.m. 7s, cp.	1911	J. & D.	.....	.....	.....
" " " 7s, rg.	1911	J. & D.	100	.....	1,000
" " " cvt. 7s, R.C	1893	J. & J.	45	.....	2,000
" " C. & I. Co., Deb 7s, R. C.	1892	M. & S.	.....	.....	.....
P. & R.C.& I. Co., m. 7s, R. C.	'92-3	various	.....	.....	.....
L. Nav. Co., 6s, rg. m.	1884	J. & Q.	104	.....	200
" " RR., rg. m.	1897	F. & Q.	.....	.....	.....
" " cvt. co. G. R.	1894	M. & S.	.....	95	.....
" " " Gold R. C.	1897	J. & D.	87½	87	13,500
" " con.m.7s, rg.	1911	J. & D.	.....	75	.....
*P.& N.Y.C., 7s, R.C.	1896 / 1906	J. & D.	.....	112	.....
*Pa. Canal, 6s. cp.	1910	J. & J.	.....	60	.....
*Schuyl. Nav., 1st m. 6s. rg	1897	M. & Q.	.....	.....	.....
*Sus. Coal, 6s, rg	1911	J. & J.	.....	.....	.....
†Balt.&O. RR., 6s.	1880	J. & J.	101½	101⅛	2,000
" " " " 6s.	1885	A. & O.	.....	.....	.....
Total transactions for the week					$151,600

Copper Stocks.

Reported by Wilson W. Fay & Co., Brokers in Mining and Miscellaneous Stocks, Room 7, Traveller Building, 31 State street.

BOSTON, Wednesday Evening, Feb. 27, 1878.

There has been a very fair amount of business the past week in these stocks, though the general tendency has been to decline, and the principal part of the business being done in the few stocks that are generally moving and fluctuating. The outside buyers are falling off, and a partial stagnation is the result, and those parties who invested lately for a rise are looking dubious, and are half inclined to close out. And yet there is no apparent reason why the market should not recover in a short time, and, with a stirring up in all other things that are at present so dull, return to the prices from which it has recently fallen.

Calumet & Hecla has fallen about as rapidly as it went up, and has sold down to 177⅞, and closes 177@177½.

Copper Falls has fallen off again and sold at $2, and closes weak at $1.87½@$2.

Franklin has relapsed into quietude after a sale at 7½, and closes weak at 6¾@7¼.

Osceola sold at 13⅛, a small lot, and afterward sold down to 12, and closes 11½@12½.

Pewabic has declined to 1¼@1½.

Quincy has fallen off and sold at 35, and closes 34½@35.

Ridge remains about the same, closing 1¼@1½.

Duncan is looking better, having advanced and sold at 2¼, but is now a little off from that figure, and closes firm at 2@2⅛.

International is quiet at .25@.35.

Merrimac Silver closes 3¼@3⅜.

Gold and Silver Stocks.

NEW YORK, Friday Evening, March 1, 1878.

The San Francisco *Stock Report* of the 22d ult. says:

"On the 15th proximo C. T. Christianson, at present cashier of the Nevada Bank, will leave for the East with his family, for the purpose of assuming charge of the branch bank to be opened in New York. It has long been known that the bonanza people intended to establish a branch of their great bank in New York, to be conducted as a corollary to the present bank here, and to encourage and facilitate mining stock transactions in the East. Indeed, a mining stock transfer agency, under the direction of Mr. Christianson, will form an important part of the institution. This announcement, coupled with the fact as related by the telegraph that the Nevada Bank of San Francisco has rented a building on Wall street for the establishment of a branch of this institution, gives reality to the stories that have been afloat on the subject, and gives to New York a more direct interest in and benefit from the wealthiest banking house in the United States."

To this must we look for an important interest in mining.

The business of this week has been less than the previous one. It has, however, been mostly confined to the low-priced stocks, of which the aggregate number of shares sold was 138,400, or within 20,000 shares of the business of the whole list, while the total value of these sales was but from $40,000 to $45,000. This enables the members of the Mining Exchange to make considerable noise, but it makes but little real business.

In these transactions the only feature of note was a rupture of the Lacrosse pool and a decline from 68c. to 57c., recovering to 66c. and closing to-day at 61c.

The dealings in American have been larger and prices weaker. The opening quotation was $11¼, while on Tuesday the price had fallen to $10. The transactions in Moose amounted to 11,950 shares, at $8¼@8⅝. Seaton, with sales of 300 shares, has declined from $2.40 to $2.35. In Ontario the sales have amounted to 1,320 shares, at 31⅝@32, an improvement on the previous week. The Comstock stocks are receiving but little attention.

The Kearsarge mine of Utah, will be entered on the list next week, and considerable excitement is looked for in the manipulation of its stock. It is supposed that it will be started at $2 per share. This mine will probably become quite speculative. It is in a limestone formation containing pockets of ore of which several limited but quite rich ones have been struck in the past. Upon the whole it has heretofore been an unprofitable mine.

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS. Feb. 23.	Feb. 25.	Feb. 26.	Feb. 27.	Feb. 28.	Opening. Mar. 1.
Alpha	10¾	10¼	10¼	10¼	10¼	10½
Belcher	4¾	4¾	5	4¾	4½	4½
Best & Belcher	18½	19	19¼	20	23¼	25½
Bullion	5	5	5	5¼	5¼	.....
Caledonia	2½	2½	2½	2¼	2½	.....
California	28¾	28¾	29	29	29	29
Chollar-Potosi	33	33	32¾	32¾	33	33
Con. Imperial	1	1	1	1	1	.....
Con. Virginia	22¼	22¼	22¼	22¼	22¼	22½
Confidence	4½	5	5	5	5	.....
Crown Point	5	4½	4½	4½	5¾	5½
Eureka Con	43½	43½	42¾	42	40½	40½
Exchequer	3½	3½	3½	3½	3½	.....
Gould & Curry	8¼	8½	8½	8½	9¼	10
Grand Prize	12¼	12¾	12¾	13	13	.....
Hale & Norcross	10¾	10½	10½	10½	10½	11¼
Julia	2¼	2¼	2¼	2¼	2¼	.....
Justice	10½	10¾	11	10½	10¼	10½
Kentuck	3½	3½	3½	3¾	3¼	3½
Mexican	13¼	13¼	13¼	13¼	13¼	13½
Northern Belle	10¾	10¾	10¾	10¾	10¾	.....
Ophir	53¾	52¾	53¼	53	54¾	55
Overman	15	15	15	15¾	15¼	15½
Raymond & Ely	5¼	5	5¼	5¼	5	5
Silver Hill	2½	2½	2¼	2¾	2¼	.....
Savage	11¾	11½	11	11	12¼	12¾
Seg. Belcher	28	26	26	26	26	.....
Sierra Nevada	4¼	4¼	4½	4¼	4¼	4½
Union Con	5¾	5¾	5¾	4¾	4¾	6
Yellow Jacket	11	10¾	10¾	10¾	10¾	11

The San Francisco *Commercial Herald* of the 20th ult commenting upon the sharp practices resorted to by min

COAL TRANSPORTATION AND GENERAL MINING STOCKS.

COAL STOCKS.

NAME AND LOCATION OF COMPANY.		Feet on Vein.	Capital Stock.	SHARES. No.	SHARES. Par Val.	ASSESSMENTS. Total levi'd to date.	ASSESSMENTS. Date and amount per share of last. Mo.	Yr.	Amt.	DIVIDENDS. Total paid to date.	Last Dividend. Mo.	Yr.	Amt.	Rate per Ann.	HIGHEST AND LOWEST PRICES PER SHARE IN CURRENCY AT WHICH SALES WERE MADE. N. B.—Quotations of D., L. & W. R. R., and Pa. Coal Co. are per $100=two shares. Feb. 23. H.	Feb. 23. L.	Feb. 25. H.	Feb. 25. L.	Feb. 26. H.	Feb. 26. L.	Feb. 27. H.	Feb. 27. L.	Feb. 28. H.	Feb. 28. L.	March 1. H.	March 1. L.	SALES.
			$			$				$				Per c'nt												
Consol. Coal	Md.		10,250,000	102,500	$100	*					Jan.	1877	2½													
Del. & H. Canal	Pa.		20,000,000	200,000	100	*				38,821,104	Aug.	1876	4	9	46¾	46⅝	46¾	46⅝	46¾	46½	47	45¾	46⅞	45⅝	47⅛	46⅝	14,524
Del., Lac. & W. R. R.	Pa.		26,200,000	524,000	$50	*					July	1876	2½	5	47⅝	47⅛	48	47¼	47⅛	47⅛	47⅝	46⅛	47⅛	46⅛	47⅜	46⅞	90,202
Lehigh C. & Nav.	Pa.		10,448,550	208,971	50	*					Nov.	1876	1½	6	16⅞	16⅛	16½	16	16⅜	16⅛	16¾	16½	17	16⅝	18	17	6,116
Lehigh Valley R. R.	Pa.		27,042,900	540,858	50	*									38¾	38½	38⅝	38¼	38⅝	38½	38⅞	38¾	38¾	38½	38⅝	38¼	1,931
Maryland Coal	Md.		4,400,000	44,000	100	*					Jan.	1876	1½	1½												
N. J. Central R. R.	Pa.		20,600,000	206,000	100	*					Apr.	1876	2½	2½	17⅜	17¼	17¼	17¼	16⅝	15	16	15½	15⅝	15¼	16	16	3,866
Pennsylvania Coal	Pa.		5,000,000	100,000	50	*					Feb.	1878	3													
Pennsylvania R. R.	Pa.		68,870,200	1,337,404	50	*					May.	1877	1½	8	29⅛	28¾	28⅜	27⅞	27⅛	27½	28½	27⅞	28⅛	28	28⅛	28¼	72,549
Phil. & Read. R. R.	Pa.		34,278,175	685,563	50	*				43,012,497	Jan.	1876	2½†	10	14⅝	14⅜	14⅜	14	14⅛	13½	14¼	14	14⅜	13⅞	14⅜	14¼	30,305

GENERAL MINING STOCKS.

Dividend Paying Mines.

American	Col.		1,000,000	100,000	10	*				30,000	Feb.	1878	$0 10	12	11¼	11	11¼		10¾		10						1,700
Belcher, G. S.	Nev.	1,040	10,400,000	104,000	100	1,176,400	Dec.	1877	1 00	15,397,200	Apr.	1876	1 00	12													
Bobtail, G.	Col.	2,500	1,136,630	227,326	5	*				56,831	Nov.	1877	25														
Bobtail Tunnel, G.	Col.		100,000	20,000	5	52,000	July	1873	0 30	40,000	Dec.	1877	50	20													
California, G. S.	Nev.	600	54,000,000	540,000	100					23,760,000	Feb.	1878	2 00	24	29½								30		30¾		45
Calumet & Hecla, C.	Mch		2,000,000	80,000	25	1,000,000				12,650,000	Feb.	1878	5 00	20													
Central, C.	Mch		500,000	20,000	25	100,000	June	1862	0 65	1,260,000	Feb.	1878	5 00														
Chollar Potosi, G. S.	Nev.	1,400	2,800,000	100,000	100	1,578,000	Jan.	1878	3 00	3,060,000	Feb.	1872	1 00														
Copper Falls, C.	Mch		1,000,000	20,000	50	535,000	May.	1876		100,000	Nov.	1871	1 00														
Cons. Virginia, G. S.	Nev.	710	54,000,000	540,000	100	474,600	June	1873	3 00	37,800,000	Feb.	1878	2 00	24									23¾		23¾		55
Confidence, G. S.	Nev.	130	2,496,000	24,960	100	243,840	Mar.	1873	1 00	78,000	May.	1865	8½	8½													
Cons. Her. & Roe	Col.	16,500	1,000,000	100,000	10	*				120,000																	
Crown Point, G. S.	Nev.	600	10,000,000	100,000	100	1,673,370	Jan.	1878	1 00	11,588,000	Jan.	1875	2 00	24													
Eureka Cons., G. S. L.	Nev.		5,000,000	50,000	100	100,000	May	1876	1 00	1,600,000	Feb.	1878	3 00	24													
Eureka G. Mg., G.	Cal.	1,680	2,000,000	20,000	100					2,134,000	Aug.	1877	2 00														
Franklin, C.	Mch		500,000	20,000	25	360,000	June	1876	5 00	585,000	Nov.	1871	1 00														
Gould & Curry, G. S.	Nev.	612	10,800,000	108,000	100	2,558,000	Dec.	1877	1 00	3,826,800	Oct.	1870	10 00														
Grand Prize	Nev.									1,200,000	Feb.	1878	1 00														
Hale & Norcross, G. S.	Nev.	400	11,200,000	112,000	100	2,746,000	Dec.	1877	1 00	1,598,000	Apr.	1871	5 00	12													
Hukill, G. S.	Col.	3,288	1,000,000	100,000	10	*				130,000	Feb.	1878	0 10	12											4.60	4½	400
Kentuck, G. S.	Nev.	95	3,000,000	30,000	100	270,000	Dec.	1874	1 00	1,252,000	Mar.	1870	5 00														
Leopard, L. G. S.	Nev.	1,500	5,000,000	50,000	100	125,000	Feb.	1878	50	162,500	Dec.	1876	0 50														
Merrimac, S.	Mas.	1,500	500,000	100,000	5	*				110,000	Jan.	1878	0 10	12			3½										25
Minesota, C.	Mch.		1,000,000	20,000	50	436,000	June	1869	1 00	1,820,000	Mar.	1876	0 50														
Moose	Col.	30,000	2,000,000	200,000	10	*				175,000	Jan.	1878	0 25	10	8½	8⅜	8½	8¼	8½	8⅜	8½		8⅜	8½	8⅜	8½	11,950
National, C.	Mch.		500,000	20,000	25	195,000	Oct.	1875	1 00	360,000	Oct.	1873	1 00														
N. Y. & Colorado, G.	Col.		1,000,000	50,000	20	*				20,000	Mar.	1877	0 20				2½	2.40							2.60	2.35	500
Northern Belle, S.	Nev.	1,600	5,000,000	50,000	100					1,425,000	Feb.	1878	1 00														
Ontario.	Uth.	3,000	10,000,000	100,000	100					900,000	Jan.	1878	0 50	6			31¾		32		32		32		31¾	32	1,320
Ophir, G. S.	Nev.	675	10,080,000	100,800	100	3,035,200	Jan.	1878		1,394,400	Mar.	1864	4 00														
Pewabic, C.	Mch.		500,000	20,000	25	135,000	June	1868	3 00	460,000	July	1873	1 00														
Phenix, C.	Mch.		1,000,000	20,000	50	817,500	Sept.	1870	3 00	20,000	Jan.	1876	1 00														
Polar Star, G. S.	Col.	1,300	500,000	50,000	10	*				5,000	Jan.	1878	0 10														
Quincy, C.	Mch.		200,000	20,000	10					2,130,000	Feb.	1877	4 00														
Raymond & Ely, G. S.	Nev.	5,000	3,000,000	30,000	100	540,000	Dec.	1876	1 00	3,075,000	Sept.	1873	3 00														
Ridge, C.	Mch.		500,000	20,000	25	200,000				90,000	Feb.	1875	1 00														
Rye Patch	Nev.	3,000				97,500	Nov.	1876	0 50	150,000	Dec.	1877	0 25														
St. Joseph, L.	Mo.	2,000 acs.	1,000,000	100,000	10					250,000																	
Savage, G. S.	Nev.	800	11,200,000	112,000	100	3,650,500	Jan.	1878	1 00	4,460,000	June	1869	3 00														
Seaton, G. S.	Col.	1,700	500,000	50,000	10	*				10,000	May	1877	0 10	12					2.40			2.40	2.35				300
Sierra Nevada, G. S.	Nev.	3,650	10,000,000	100,000	100	1,000,000	Jan.	1878	0 50	102,000	Jan.	1871	1 00	10													
Silver King										200,000	Feb.	1878	0 50														
Standard	Cal.									300,000	Feb.	1878	1 00														
Yellow Jacket, G. S.	Nev.	1,200	12,000,000	120,000	100	3,438,000	Jan.	1878	2 00	2,184,000	Aug.	1871	2 50														

Non-Dividend Mines.

Allouez, C.	Mch.		1,000,000	20,000	50	940,000	May	1876	5 00																			
Alpha, G. S.	Nev.	300	3,000,000	3,000	100	210,000	Aug.	1877	1 00																			
Am. Flag, G.	Col.	5,300	600,000	60,000	10	*									25c	22c	27c	23c	23c	19c	22c	20c	23c	21c	23c	22c	20,600
Bertha & Edith. G.	Vir.	645 acs.	3,500,000	350,000	10	*									16c	14c	16c	14c	15c	12c	13c	12c	13c	11c	14c	12c	73,300
Best & Belcher, G. S.	Nev.	545	10,080,000	100,800	100	337,792	Aug.	1877	1 00																			
Bullion, G. S.	Nev.	943⅛	10,000,000	100,000	100	2,802,000	Jan.	1878	1 00																			
Caledonia, G. S.	Nev.	2,188	10,000,000	100,000	100	1,435,000	Oct.	1877	0 75																			
Cleveland, G.	Col.	3,715	250,000	25,000	10																							
Cons. Imperial, G. S.	Nev.	468	50,000,000	500,000	100	575,000	Oct	1877	0 20																			
Con. N. Slope & E. C.T.	Col.	15,000	500,000	10,000	50	*																						
Dana, C.	Mch.		500,000	20,000	25	68,000	Jan.	1863	0 50																			
Dawson, S.	Ont.		1,200,000	60,000	20																							
Duncan, S.	Ont.		1,200,000	60,000	20	75,000	July	1876	41¼																			
Exchequer, G. S.	Nev.	400	10,000,000	100,000	100	380,000	Jan.	1878	1 00								3										50
Granville, G.	N. C.	9,000	1,000,000	100,000	10	*			0 50																			
Humboldt, C.	Mch.		500,000	20,000	25	100,000	Sept	1876	0 15																			
International, S.	Ont.		1,200,000	60,000	20																							
Julia, G. S.	Nev.	3,000	11,000,000	110,000	100	525,000	Jan.	1878	0 75																			
Justice, G. S.	Nev.	2,100	10,500,000	105,000	100	2,237,500	Jan.	1878	2 00																			
Kings Mountain, G.	N. C.		1,200,000	120,000	10	*																						
Lacrosse	Col.	3,900	1,000,000	100,000	10	*									3	2.90	3	2.95	3	2¾			2.70		2.65	2½	1,900
Lucerne	Col.	4,200	5,000,000	500,000	10	*									68c	67c	68c	64c	65c	59c	61c	57c	66c	58c	64c	60c	44,550
Madison, C.	Mch.		500,000	20,000	25	123,000	Sept	1876	0 10																			
Mariposa preferred	Cal.	44,387	5,000,000	50,000	100	1,425,000	June	1877	1 00						2½		4	2½			2½		2½		2½		605
" common	Cal.	acres.	10,000,000	100,000	100	1,425,000	June	1877	1 00						2		2.20	2	2		2.10	2					900
Memphis	Col.	6,000	300,000	60,000	5	*											25c				35c						200
Mesnard, C.	Mch.		500,000	20,000	25	160,000	Apr.	1876	0 50																			
Mexican, G. S.	Nev.	600	10,080,000	100,800	100	181,440	Aug.	1877	0 30																			
Overman, G. S.	Mch.		1,000,000	40,000	25	3,053,880	Feb.	1878	3 00																			
Osceola, C.	Nev.	1,200	3,840,000	38,400	100	2,567,880	Nov.	1877	3 00																			
Petherick, C.	Mch.		500,000	20,000	25	165,533	Mar.	1876	0 50																			
Pleasant View, G.	Col.	1,200	200,000	20,000	10	*																						
Quicksilver preferred	Cal.	8,500	4,291,300			*											31⅜				30						200
" common	Cal.	acres.	5,708,700	100,000	100										19½	18¾	19¾	19½	18⅞	18½							1,400
Rockland, C.	Mch		500,000	20,000	25	495,000	Jan.	1874	1 00																			
Seg. Belcher, G. S.	Nev.	160	640,000	6,400	100	244,800	Apr.	1876	5 00																			
Silver City, G. S.	Nev.	3,900	6,310,000	63,100	100	15,775	Nov.	1875	0 25																			
Silver Hill, G. S.	Nev.	5,400	5,400,000	54,000	100	192,600	Dec.	1877	1 00																			
Star, C.	Mch.		500,000	20,000	25	265,000	Mar.	1876	0 50																			
Superior, C.	Mch.		500,000	20,000	25	340,000	Mar.	1874	0 25																			
Union Cons. G. S.	Nev.	850	10,000,000	100,000	100	285,000	Oct.	1877	0 25																			

G. Gold. S. Silver. L. Lead. C. Copper. * Non-Assessable.

Total Assessment levied to date..... 50,928,210 | Total Sales of Coal Stocks for the week..... 219,493 shares.
Total Mining Dividends to date..... 217,825,832 | Total Sales of Mining Shares for the week..... 160,000 "

† A dividend of 3½ per cent. was declared on the preferred stock of this Co. in July.

ing-stock operators in that market, says: " * * * The impression widely prevails in stock-dealing circles that the Bonanza firm entertain a purpose of purging that business of some of its minor irregularities at least. The abuses to which the traffic in mining shares has long been subjected no doubt calls for correction, since without amendment of some of its more objectionable features there is danger that the general public will turn their backs upon the business altogether. This being the case, it is only natural, then, that these parties should desire to avert such result, supposing them to be actuated by no higher motive than self interest. But why should not men of their great wealth be moved by a hearty desire to have stock operations wholly delivered from the hands of the shysters that have so largely controlled and conducted them, and to see them carried on after the manner of other honorable and legitimate pursuits? To accomplish this is an end that might well engage their ambition, and it would really be cause for surprise were they to fail exerting themselves to remove this taint from a calling with which they must, from necessity, be so intimately identified. If now they will use their power and influence to reform this business in an indiscriminate and unselfish way, they will have done a good work, and entitle themselves to the thanks of the community. If they will, in this regard, pursue a policy like that long since adopted by them in the management of the mines themselves, where they not only accepted all that was most approved and advanced, but invested and brought into use much that was superior to anything before devised, then they will lift this business to a higher plane than it ever yet has occupied, and higher than it can hope to reach without their active coöperation and approval."

The Gold Hill *News* of the 20th inst. says: "Several important air and working connections have been made during the week. The Bullion incline has made a connection with their upraise from the 1,840 level, affording an opportunity for a thorough prospecting of a large portion of their mine, which could not be reached heretofore on account of the great heat. The Gould & Curry incline was also connected with their upraise from the 1,900 level today, which will enable them shortly to resume active prospecting on that level.

The ore improvement on the lower levels of the Belcher continues, and the Justice is about adding fifty tons of ore per day to their production and another mill to their crushing force.

The east drift on the 2,200 level of the Yellow Jacket has reached a point directly under this new shaft, so that an upraise can now be made to meet the shaft if it is desirable to do so. This shaft is 2,600 feet east of the old shaft, and is now down 1,242 feet, and would have 1,040 feet to sink to complete the connection. A drift east from the 2,400 station of the Imperial would have only about 700 feet to run to connect with the bottom of the Yellow Jacket shaft."

Trojan Gold & Silver Mining Co.—The annual meeting of this company was held in San Francisco on the 15th ult. The Secretary's report for the fiscal year ending January 31 gave the following items: The total receipts of the year were $121,102.87. Of this $30,737.84 is still due from J. W. Pearson, the late Treasurer; $50,000 was derived from assessments Nos. 5 and 6, levied respectively on July 26 and December 27, 1877. The bullion account footed up $85,293.56, including ore at the Vivian and Succor mills. The disbursements for the year were $91,975.10, consisting of mining expenses, $41,700.98; milling expenses, $34,202.22, and general expenses $16,071.90, which included $5,940.43 legal expenses. This mine is located on the Comstock Lode.

Sutro Tunnel.—Total length of tunnel, on the 20th ult., 18,981 ft. The temperature of the air at the header is 108 degrees. The face of the header is in very favorable ground, the blasts throwing out well. The entire flow of water from the tunnel is 1,290,000 gallons per day, but a very small portion of which, however, comes from the face of the tunnel. The average rate of progress is about 7 ft. per day.

The Black Sand Mining Co., organized to gather gold from the sands of the Oregon coast, has filed a petition in bankruptcy.

Sherbrooke Gold Mining Co. of Nova Scotia.—The annual meeting of this company will be held March 6, in this city.

The Rescue Mining Co. will hold its annual meeting for the election of officers March 12.

INCORPORATIONS.

We note the recent organization of the following companies in addition to those announced in our issue of February 2:

Ellen Gowan Mining Co	Ariz.	$10,000,000
Moreno " "	"	10,000,000
Pinal Mill & " "	"	60,000
Arizona Mineral & Land Co	"	100,000
San Xavier Mining & Smelting Co	"	
Esperanza Silver Mining Co	"	10,000,000
Prescott Prospecting Mill & M. Co	"	10,000,000
South Tiger Mining Co	"	10,000,000
New Mercer Ditch Co	Nev.	16,000
Rocky Mountain Ditch Co	"	50,000
Great Eastern Mining Co	"	3,000,000
Rising Sun " "	"	6,000,000
Byron Gold & Silver Mining Co	Colo.	1,000,000
Buck-Eye Ditch Co	"	1,000
Toleto Mining Co	Cal.	1,000,000
Hidalgo Mining & Smelting Co	"	10,000,000
Fatner De Smet Cons. Gold M. Co.	Dakota.	10,000,000
El Dorado Silver Mining Co		1,000,000

Assessments, with dates, when delinquent: DeFrees, 25c., March 25; Baltimore Con., 50c., March 18; McClinton, 50c., March 18; Union Con., 25c., May 1; Monumental, 10c., March 19.

Dividends: Silver King Mining Co. has declared a dividend of 50 cents per share.

Gas Stocks.

NEW YORK, Friday Evening, March 1, 1878.

We still continue, in such changes as are made in our list, as lower the quotations of gas stocks. All of the New York companies show declines ranging from $3 to $5 per share. The stock of the Harlem Company, and also that of the Williamsburgh are down $5 per share each. No sales are reported.

Fredericton, N. B.—At this place the price of gas is now $3.50 per thousand feet.

The American Hydrocarbon Gas Company, of Columbiana, Ohio, capital stock $100,000, has filed a certificate of incorporation.

Galena, Ill.—$4 per thousand feet is charged for gas at this place.

St. Catharines, Ont.—The price of gas in this place is reduced from $2.80 to $2.50 per thousand feet.

New Gas Works Proposed for St. Joseph, Mo.—Chas. H. Nash, President of the Detroit Mutual Gas Light Company, has purchased lands in St. Joseph, Mo., on which new gas works will be immediately erected. Gas will be furnished at greatly reduced rates.

San Francisco Gas Light Co.—This stock is unsettled, and quotations are generally nominal. We note a recent sale of 100 shares at $92 per share, which may be taken as the nominal price.

Coupons on the bonds of the following companies will fall due during the present month:

Baltimore Gas Light Co.; coupons.
Central Gas Light Co.; coupons.
Citizens' Gas Light Co of Rochester, N. Y.—Coupons.
Laclede (St. Louis) Gas Co. of St. Louis.—Coupons.
Westchester (N. Y.) Gas Co.—Coupons.

RECENT AUCTION SALES.

New York Gas Light Company, 20 shares at $119.
Cambridge (Mass.) Gas Company, 5 shares at $1.37½.
Boston Gas Company, 2 shares at $817½.
Bath (Me.) Gas Company, 3 shares at $72.
Manhattan (N. Y.) Gas Company, 200 shares at $202@203.
People's Gas Co. of Baltimore.—110 shares of this company's stock sold during the week at from 12¾ to 12¼ per cent.

COMPANIES IN NEW YORK AND VICINITY.	Capital Stock.	Par.	DIVIDENDS. Rate per ann.	DIVIDENDS. Am. of last.	DIVIDENDS. Date of last.	QUOTATIONS Bid.	QUOTATIONS As'd.
	$		P. ct.				
Mutual, N. Y.	5,000,000	$100	10	2½	Jan., '78	80	85
" Gold Bds.	90,000	1,000	7	3½	Feb., '77	100	103
N. York "	4,000,000	.....	10	5	Nov., '77	115	120
Metrop. "	2,500,000	100	10	5	June, '77	120	133
" G. Certfs.	1,000,000	.....	7	3½	" "	100	103
" Gold Bds.	500,000	1,000	7	3½	" "	102	....
Harlem "	1,850,000	50	8	3½	Aug., '77	90	95
Manhat. "	4,000,000	50	....‡	5	Nov., '77	200	204
Brooklyn, Bkln.	2,000,000	52	15	5	Dec., '77	155	165
Nassau, G. Bds.	1,000,000	25	....‡	3	Jan., '78	70	80
" G. Certfs.	700,000	1,000	7	3½	July, '77	....	101
People's, G. Bds.	1,000,000	10	....‡	3½	July, '76	20	40
" G. Certfs.	300,000	1,000	7	3½	July, '77	80	85
" Gold Bds.	325,000	.....	7	3	Feb., '77	96	100
Metrop. "	1,000,000	10	5	2½	Nov., '77	68	72½
W'msb'g "	1,000,000	50	10	2½	July '77	100	110
" G. Certfs.	1,000,000	.....	7	3½	July '77	100	102
Citizens', G. Bds.	1,200,000	20	....‡	3	Jan '78	81	85
" G. Certfs.	320,000	1,000	7	3½	Oct., '77	97	100
J. C., N. J.	750,000	20	10	5	July, '77	160	....
Cen. Wstch. N. Y.	466,000	50	7	4	July, '77	75	85
Subur'n, "	295,000	50	7	3½	Oct., '77	....	95
Municipal, N. Y.	1,500,000	100	.....	.....	.....	90	100

‡ Paid irregularly.

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